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CONTENTS

SPINAL ANESTHESIA WITH REDUCED DOSAGE OF SPINOCAIN.
Arnold Schwyzer, M.D., Saint Paul 855

THE PRACTICAL VALUE OF EXAMINATION OF BLOOD SMEARS.
Charles H. Watkins, M.D., and *Frank J. Heck, M.D.*, Rochester 860

FURTHER OBSERVATIONS ON THE TREATMENT OF PERNICIOUS ANEMIA WITH GASTRIC TISSUE OF SWINE.
H. Milton Conner, M.D., Rochester 865

THE INTRAVENOUS ADMINISTRATION OF SODIUM ISO-AMYLETHYL BARBITURATE (SODIUM AMYTAL) FOR THE ALLEVIATION OF PAIN DURING LABOR.
James J. Swendson, M.D., Saint Paul 868

THE USE OF SODIUM AMYLETHYL BARBITURATE IN NERVOUS DISORDERS.
L. R. Gowan, M.D., Duluth 874

THE PROBLEM OF DISEASE OF THE PARANASAL SINUSES.
Harold I. Lillie, M.D., Rochester 877

PALSY OF THE CRANIAL NERVES.
Lloyd H. Ziegler, M.D., Rochester 880

ENCEPHALITIS.
William H. Hengstler, M.D., and *George N. Ruhberg, M.D.*, Saint Paul 888

THE SIGNIFICANCE OF TEMPORARY BLINDNESS.
William L. Benedict, M.D., Rochester 891

CIRCULATORY TESTS PREVIOUS TO AMPUTATION.
William T. Peyton, M.D., Minneapolis 896

RECURRENT LYMPHANGITIS.
William H. Goeckerman, M.D., Rochester 902

CASE REPORTS:
Leg Lengthening for Shortening Due to Infantile Paralysis.
Wallace H. Cole, M.D., Saint Paul 904

Intestinal Foreign Bodies.
Fred H. Stangl, M.D., St. Cloud 909

Ureteral Stone with Periureteral Extravasation.
Arthur N. Collins, M.D., and *Gage Clement, M.D.*, Duluth 910

PRESIDENT'S LETTER 912

EDITORIAL:
The Anti-Vivisection Bill 913
Women's State Auxiliary 914
History Committee 914

NEW AND NON-OFFICIAL REMEDIES 915

COMMITTEE ON PUBLIC HEALTH EDUCATION 916

OF GENERAL INTEREST 917

CONSULTATION BUREAU 918

MISCELLANEOUS:
Getting Into Print: An Exhibit for Medical Writers 919
Minnesota State Board of Medical Examiners 920
Hospital Chart Ownership 920
Fellowships for Training in Extramural Psychiatry 922

REPORTS AND ANNOUNCEMENTS OF SOCIETIES:
Medical Broadcast for the Month 923
Minnesota State Medical Association 923
Minnesota Radiological Society 923
Women's Auxiliary 923

PROCEEDINGS OF THE MINNEAPOLIS SURGICAL SOCIETY 924

PROGRESS:
Eye, Ear, Nose and Throat 929
Pediatrics 929

BOOK REVIEWS 930

INDEX TO VOLUME XIII 931

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MINNESOTA MEDICINE

Journal of the Minnesota State Medical Association. Southern Minnesota Medical Association, Northern Minnesota Medical Association, Minnesota Academy of Medicine and Minneapolis Surgical Society.

VOL. XIII December, 1930 No. 12

SPINAL ANESTHESIA WITH REDUCED DOSAGE OF SPINOCAIN*

ARNOLD SCHWYZER, M.D.
Saint Paul

IT IS not our intention to discuss the value of spinal anesthesia, nor the advantages of spinocain (Pitkin) over other methods. Whoever has seen the perfect relaxation of the abdominal walls in a difficult operation in the upper abdomen readily recognizes the advantages of the method; but the fear of accidents has kept many surgeons from employing the method. The danger is, of course, proportionate to the dose of the anesthetic.

We simply want to mention, for the benefit of those who are using the method, a way of getting along quite well with considerably less spinocain than is generally given. The dose is hardly more than half of what we had to use formerly in order to obtain a satisfactory anesthesia. Spinocain is lighter than the cerebro-spinal fluid, and for this reason can, as it were, be floated to any position we desire, though the difference in specific weight of the spinocain (1.005) and of the cerebro-spinal fluid (1.007) is not great. Of course spinocain will diffuse rather rapidly and the novocain in it become fixed to the adjoining nerve tissue. For this reason it is desirable to bring it as rapidly as possible to the place where it is needed. The dorsal curve of the vertebral column, with the patient on his back, tends to bring the bulk into the lumbar arch. In order to reach the lower dorsal segments, the head of the table is raised. The anesthetic reaches the dorsal curve, and if the operation is to extend to the epigastrium the fifth or sixth root has to be reached. The ramus perforans anterior of the sixth thoracic nerve takes care of the sensation of the area about the base of the ensiform process, while the seventh supplies the region to the side of the ensiform. We ought to reach therefore the fifth root with our anesthetic because of the law of overlapping in the sensory distribution. If you look at the curve of the vertebral column of an individual lying on his back, you can readily see that sufficient tilting to cause the spinocain to float to the fifth nerve, or even only to the sixth or seventh, will allow it to escape toward the cervical spine, where it is not wanted and may cause trouble.

If you turn the patient onto the stomach, the dorsal curve allows you by proper tilting to bring the anesthetic to the exact spot desired. The head is kept low and the spinocain can not reach the cervical region before a considerable part of it has been fixed and only a small balance of novocaine has diffused. Looking over the back of the patient, with some horizontal line on the wall of the room as guide, one can readily make out the highest point in the dorsal curve. This is the whole trick. The spinocain thus does not go higher than we want it. It can therefore be injected undiluted with spinal fluid, and for this reason it will ascend more promptly before it is diffused and part of it fixed by nerve tissue. It will reach the desired upper levels in more concentrated form and it will above all strike the sensory and not the motor roots first. It will strike them posteriorly where they are still fine separate fibres. If we are to operate on the right side of the abdomen, the patient, after the spinal injection, is turned toward the stomach with the right shoulder higher than the left. If one operates on the left side, the left shoulder is made the highest spot. The fibres of this side then get the most direct anesthetic effect. Leaving out of consideration the anesthesia of the cauda equina, where turning on the stomach is of no value, it is evident that with the patient lying on the back the sensory thoracic roots re-

*Read before the Ramsey County Medical Society, St. Paul, Sept. 29, 1930.

ceive the anesthetic only after a certain amount of diffusion has reached the lateral areas of the spinal canal. This occurs after the motor roots and the cord surface have fixed part of the anesthetic. It has often happened since we have adopted the method of turning the patient toward

Fig. 1. Showing dorsal curve. Its apex is readily found by watching the horizontal lines on wall.

the stomach that we could start the operation while the patient could still wiggle the feet, though the abdomen was relaxed. In other words the spinocain ascended promptly after injection. With very small doses the relaxation was not perhaps always as complete as with the old way of turning the patient promptly onto his back. We usually leave the patient in the properly measured elevated position for about four or five minutes after the injection before turning him over on his back on the level table. By this time most of the novocain ought to be fixed to the neighboring nerve tissue. If doses larger than one ampoule are given, the patient after four and a half minutes of elevated position is tilted with the head low for half a minute before turning him on his back in order to counteract any undesired ascending of spinocain along the upper dorsal curve. I am, however, not sure that this is of any particular value after this lapse of time.

Let us repeat that it is here not our aim to make an appeal for spinal anesthesia in general nor even for spinocain, though we consider it a very important addition to anesthesia. Before I saw the beauty of a good spinocain anesthesia I had refused to take the risks of spinal anesthesia with my patients. Even now we are not sold on the spinal method. Since about the first of the year we have turned the patients over on the stomach after injection. Of 382 operations performed since January 1, 1930, 125 were done under local anesthesia, while spinal anesthesia was used in only 95 cases. In two additional instances spinal anesthesia was attempted but could not be carried out. These were not injected. In one of these the spinal canal was apparently entered but no fluid came and we did not repeat the maneuver; in the second case blood came.

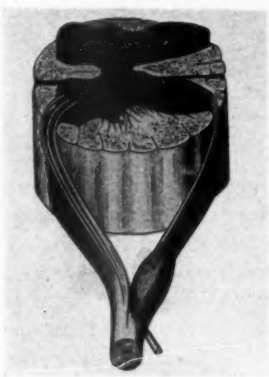

Fig. 2. Cross section of cord. Note the separate nerve fibres as they emerge from cord.

Among the ninety-five injections three were definite failures, probably due to too small a dose or to some faulty technic. The anesthesia was very insufficient. The other 92 anesthesias were considered satisfactory. Fourteen were marked as "reasonably good" on the chart and 76 as "excellent." In two cases I find no detailed notes. Among the cases judged as "reasonably good" there were instances of vomiting, or a return of sensation at the end of the operation. In four of these cases, to be mentioned later, the anesthesia had to be assisted by other means. It must be taken into consideration that at this time we were trying to find the smallest permissible doses. The site of preference for the injection in upper abdominal surgery is with us between the second and third lumbar vertebræ. Cerebro-spinal fluid is not withdrawn, especially if not more than one ampoule is given.

About four months ago the writer had acute appendicitis and the occasion was made use of in testing the method. My assistant, Dr. R. T. Muller, who performed about half of the anesthesias of the group of cases here presented (the other half having been done by the writer), injected 1.6 c.c. spinocain preceded by one and a half ampoules of ephedrin (Pitkin) subcutaneously. The usual preoperative morphine and atropine hypodermic was omitted. Apart from

the skin prick nothing was felt upon injection. I had to be told that the injection was completed. No paresthesia occurred. At times some patients had claimed they felt an itching at the start of the anesthesia. The operation was absolutely painless. At one time only, when some strong traction was made with a retractor, there was a gentle painless sensation of pulling downward on the skin in the region of the left nipple. The surgeons were emphatic in speaking of the complete relaxation of the abdominal muscles even when the peritoneum was lifted by forceps at the time of closure. About one hour after the injection sensation and motion started to return and were practically normal half an hour later. Painful spasms in the muscles of the back and abdomen on the right side had been present before operation and had somewhat blurred the issue. These persisted for several days after the operation. They re-appeared after operation with the restoration of nerve conduction and caused the patient to seek relief by getting up and sitting in an easy chair five hours after the injection. As the sitting posture relieved the spasms very much, several hours were thus spent in the chair reading a book. No untoward symptom followed the operation, no trace of nausea or headache, no afterpain except the normal moderate soreness in the wound.

In order to give a general picture of the nature of operations and the dose used we will group these 92 cases according to the dose of spinocain. The patients were all adults or at least 17 years of age.

The largest dose given was 3 c.c. This does not mean that it would not have been better to have given a little more in a very long operation, nor that some of the patients could not have gotten along quite well with less.

Cases	Spinocain
6	3 c.c.
7	2.75 c.c.
43	2 c.c.
36	less than 2 c.c.

Of these 36 cases receiving less than 2 c.c.

19 received	from 1.8 c.c. to 1.6 c.c.
14	1.5 c.c.
2	1.4 c.c.
1	1.33 c.c.

The six cases in which the maximal dose, i. e., *3 c.c. spinocain* was given, were the following:

One, a resection of the stomach with a large resection of the corpus pancreatis.

One, a very large hematoma retrocolicum the nature of which was unknown before operation.

One, gallstones with a cholecysto-duodenal fistula.

One, gallstones and appendicitis in a very large person.

One, gallstones and acute cholecystitis, also in a large person.

One, a gastro-jejunal ulcer.

The seven cases receiving 2.75 c.c. spinocain were:

3 cholecystectomies, two of them with acute cholecystitis, one with pericholecystitic abscesses.

2 cases of branched kidney stones.

1 a carcinoma (primary) of the Fallopian tube in a very large woman.

1 an acute perforation of a duodenal ulcer.

In 43 instances 2 c.c. spinocain (200 milligrams of novocain) were given:

1 an endothelioma of the pleura.

11 cholecystectomies (some with appendectomy).

1 a carcinoma of the pancreas; cholecystogastrostomy.

1 a carcinoma of the cecum; ileo-colic resection.

1 abdominal hysterectomy.

4 abdominal hysteromyomectomies.

6 appendectomies, acute or in interval; 3 of them with Watkins' operation for cystocele and perineoplasty.

4 abdominal hernias.

4 pelvic laparatomies, some combined with perineal work.

4 suprapubic prostatectomies.

5 Watkins' operation with perineoplasty (one with operation for bunions).

1 a post-anal dermal inclusion, acutely inflamed.

Less than 2 c.c. spinocain was administered to 36 patients. From 1.8 to 1.6 c.c. were given in the following 19 cases:

6 cholecystectomies (mostly with appendectomy).

3 diffuse peritonitis from appendicitis.

4 appendicitis.

1 carcinoma of ovary; large fixed mass, suture of ruptured sigmoid.

3 ovarian cysts.
1 carcinoma of leg after burn; excision and transplantation.
1 perineoplasty and hemorrhoidectomy.

1.5 c.c. spinocain was given in:

4 cholecystectomies.
1 gastrostomy.
2 double inguinal herniæ.
1 anus præternaturalis.
1 exploratory laparotomy in diffuse carcinomatosis of peritoneum.
1 cystoma ovarii malignum.
1 carcinoma of large myomatous uterus, grown into mesosalpinx (44 per cent hemoglobin).
1 appendectomy and perineoplasty.
1 cystoscopic dilatation of ureter in man.
1 curettage, perineoplasty and hemorrhoidectomy.

1.4 c.c. spinocain was given in:

1 carcinoma of rectum; excision. A little gas needed.
1 acute appendicitis gangrenosa. Excellent anesthesia.

1.33 c.c. spinocain was given in:

1 appendicitis subacuta. A little local anesthesia for the skin was added.

All the operations were done at St. Joseph's hospital except one of the cases of renal calculi, which was at the University hospital.

The patients to whom we gave more than one 2 c.c. ampoule almost all had lesions of the upper abdomen where a tedious operation was anticipated. Nevertheless you may have noticed that for instance among the 27 cholecystectomies there were 21 who had received at most 1 ampoule or even as little as 1.5 c.c. The case of endothelioma of the pleura received only 1 ampoule. In this instance the sixth, seventh, eighth ribs with the intervening structures of the chest wall had to be extensively resected and also a small area of the diaphragm where the tumor was adherent. The anesthesia was ideal. The ileo-colic resection was done with one ampoule and the anesthesia was all one could possibly wish. All pelvic work, herniæ among which were four very tedious postoperative abdominal herniæ with adherent intestines, appendicitis, acute or chronic, with or without free peritonitis, were never given more than 1 ampoule and very frequently less.

Similar cases were of course operated upon under general anesthesia, but if anything the more serious and tedious ones were chosen for spinal anesthesia.

With more experience the dose was gradually reduced. Among the last sixty cases of spinal anesthesia there were only four who received more than one ampoule (2 c.c.) of spinocain and among the last thirty-seven cases only eight had as much as 2 c.c. while the balance had often materially less.

In this list of ninety-two anesthesias which were classed as satisfactory there are, however, four instances where the spinal anesthesia alone was not sufficient. The first one of these was a resection of the stomach with a large resection of the middle portion of the pancreas. Three c.c. of spinocain were given. The operation took unduly long, lasting two hours and thirty-five minutes, and for the closing of the abdomen gas-ether was given. Up to that moment the anesthesia had been ideal. Another patient had received 1.7 c.c. for a cholecystectomy and appendectomy. When pulling on the cystic duct caused pain, gas was given for a few moments. The third case was an appendicitis where we tried the low dose of 1.33 c.c. Perhaps we started a little too soon with the operation; instead of waiting longer the skin was infiltrated with novocain. The fourth case was an excision of a carcinomatous rectum which was attempted with as little as 1.4 c.c. for trial. Less than half of the usual dose of gas was needed and no ether.

There were no untoward accidents, not even moments of apprehension in this group. Among the 95 patients operated upon under spinal anesthesia since January 1st, which includes the three unsatisfactory injections, there was one postoperative death—the carcinoma of the pancreas where a cholecysto-gastrostomy was done. It was not due to the anesthesia. The patient with his far advanced condition died a week after the operation in icterus gravis from terminal pneumonia. The number is of course far too small to give this statement any weight. But whatever the danger from spinal anesthesia may be it must be chalked up against spinal anesthesia in general, and not against the modification which consists of cutting this danger in half.

Before using our present modification we had a much larger percentage of instances where gas had to be added for a satisfactory anesthesia. This was undoubtedly mostly due to inexperi-

ence, but the doses over 3.25 c.c. spinocain caused at times apprehension which made the innovation of turning the patients over and thereby reducing the required dose by nearly one-half not only welcome to us but to several of our colleagues at St. Joseph's hospital who are emphatic in their statement as to the benefit they derived from this modification. Doctors W. C. Carroll, E. M. Jones, F. E. B. Foley, W. C. Rutherford, F. C. Schuldt, F. H. Neher, E. H. Norris and others have thus expressed themselves. Dr. Carroll started to use our modification soon after we did. He was emphatic as to the reduction in the dose of spinocain made possible by this method.

Dr. Foley uses our modification routinely at the Ancker (municipal) hospital in his urological service. He declares he has not had a failure since he adopted the procedure. The usual dose given was 2 c.c.

Dr. W. C. Rutherford states that by this manner of turning the patients over he can bring the anesthesia high enough for upper abdominal work without the apprehension he experienced previously, and that instead of giving 3 c.c. spinocain he can get along with 1.5 to 2 c.c.

Dr. Norris was converted to our procedure by an experience in a case of left sided inguinal hernia. Two c.c. of spinocain were injected while the patient rested on his left side. There was some delay in turning the patient on his back and he remained for five or six minutes on his left side. When he was finally placed on his back it was found that he had obtained perfect anesthesia on the right side of the abdomen, but almost none on the left. It was necessary to wait nearly fifteen minutes before the anesthesia appeared on the left side.

To sum up: We avoid mixing the spinal fluid with the spinocain by repeated withdrawals. We try to bring the undiluted spinocain as quickly as possible to the dorsal roots of the desired area. By this modification in the use of spinocain the dose can be reduced materially, the sensory roots getting the anesthetic directly in the least diluted form; the height of the anesthesia can be accurately arranged for, and the entrance into the cervical region (when it is not desired) is excluded, if we leave out of consideration a small amount of diffused novocain after most of it has been absorbed and fixed in the area where it was first brought to.

It would of course be very improper to try to raise this procedure to the dignity of a "method" and thus to somewhat lose sight of the real work done by Dr. Pitkin.

THE PRACTICAL VALUE OF EXAMINATION OF BLOOD SMEARS*

CHARLES H. WATKINS, M.D., and FRANK J. HECK, M.D.
Rochester, Minnesota

EXCEPT for an occasional differential count, examination of the blood smear has to a very large extent been discarded by most men in general practice. Although determination of values for hemoglobin and erythrocytes gives much information, still it is only through examination of the smears that information as to whether or not the bone marrow is active, and, if it is active, the extent of this activity, can be obtained. In primary types of anemia the percentage of reticulated erythrocytes has been used as an index of the response to treatment. In the renewed interest in secondary anemia which has arisen in the last five years, comparatively little attention has been paid to these features of activity of the bone marrow. The technic of examination of smears is relatively simple. Special training is not required, except for recognition of rare types of leukemia or of conditions in which immature cells are just beginning to appear in the circulation and are present only in small numbers. The physician in general practice can carry out every necessary procedure for the diagnosis of diseases of the blood, since this requires only the equipment which should be in every physician's laboratory.

In order properly to interpret the smears, it is necessary that the technical procedure be given consideration. One of the most important features is the correct making of blood smears. Satisfactory smears may be obtained by the following method:

Preparation of slides:

1. Place in glacial acetic acid for fifteen minutes.
2. Wash in distilled water.
3. Place in 95 per cent ethyl alcohol for five minutes.
4. Dry with clean towel.
5. Pass through flame of alcohol or Bunsen burner two or three times.

Making the blood smear:

1. Hold slide by edges and touch against drop of blood so that two or three small drops lie across one end of slide.
2. Place this slide on a flat surface.
3. Take another slide; place it on middle of lower slide at angle of 30°. Draw slide backward into blood and then push forward, distributing the blood evenly. Do not exert pressure; the weight of the slide is sufficient. To make a thick smear use a rapid motion; to make a thin smear use slow motion.
4. Whip slide rapidly through the air until dry.

Wright's stain is most widely used in this country. The greatest difficulty attendant on its use is to obtain satisfactory distilled water, since if the water is too acid or is alkaline, improper staining of both erythrocytes and leukocytes results. However, since the introduction of buffer solution[2, 3] this difficulty has been eliminated and staining with Wright's stain has become a simple procedure; buffer solution maintains a hydrogen-ion concentration which is little affected by the addition of small quantities of acid or alkali. The solution recommended is made up as follows: 6.63 gm. of acid potassium phosphate (KH_2PO_4) and 3.2 gm. of dibasic sodium phosphate ($Na_2HPO_4.2H_2O$). These amounts are dissolved in 1,000 c.c. of the distilled water that is to be used.

Wright's stain is prepared by grinding 0.3 gm. of the dry stain in 100 c.c. of acetone-free absolute methyl alcohol. There are several satisfactory brands of the stain, already in solution, on the market. The technic of staining may be summarized as follows: Place 25 to 30 drops of Wright's stain on the blood film and allow it to stand one minute. Add an equal number of drops of buffer solution and allow the mixture to remain four minutes. Wash with distilled water and dry between blotting paper. If this technic is followed, an

*From the Division of Medicine, The Mayo Clinic, Rochester, Minnesota. Read before the Minnesota State Medical Association, Duluth, July 14 to 16, 1930.

excellently stained slide is almost invariably obtained. It is unnecessary to change the time of staining with various lots of stain.

One of the most accurate indexes for determining the activity of the bone marrow is estimation of the percentage of reticulated erythrocytes. Reticulation is the result of a chemical reaction between a vital stain and the undifferentiated spongioplasm of the erythrocyte. Brilliant cresyl blue is the vital stain which is most commonly used in demonstrating this reaction. There are many methods in use, but the following has been found satisfactory for routine work. A small drop of freshly drawn blood is placed on the end of a clean slide. To this is added a small drop of saturated aqueous solution of brilliant cresyl blue, and the two are then thoroughly mixed with a clean glass rod. A smear is then made in the same manner as that employed in making the ordinary blood smear, and this is counterstained with Wright's stain. The number of reticulated cells in 1,000 erythrocytes is then determined and the percentage of reticulated erythrocytes present is calculated. Since reduction of the size of the field facilitates counting, we use a metal disk with a small aperture. Normally the percentage is between 0.5 and 1.5 per cent. Increase in the proportion of reticulated erythrocytes indicates hyperactivity of the bone marrow whereas decrease indicates lack of proper activity. The reticulated erythrocyte count is of particular value in determining the efficacy of treatment in severe cases of pernicious anemia. On adequate treatment, the response of reticulated erythrocytes reaches a maximum between the eighth and twelfth days, and by the thirtieth day it usually has returned to normal.

Before considering the more significant morphologic features of the cellular elements in primary and secondary diseases of the blood, a word should be said regarding the degenerative and regenerative signs as seen in the erythrocytes. Of the features of degeneration, the following are the most important: (1) hypochromasia, in which decrease in the hemoglobin in the erythrocyte, results in a uniformly pale cell, and (2) poikilocytosis in which erythrocytes are irregularly shaped; pear-like shapes and club-like shapes are most common. The most important signs of normal or physiologic regeneration are (1) reticulation of erythrocytes which has been described; (2) polychromatophilia in which the erythrocytes still retain sufficient basophilic spongioplasm to give a bluish or greenish tint to the cytoplasm when the cells have been stained with Wright's stain; (3) anisocytosis in which there is variation in the size of cells, particularly of macrocytes and normocytes; (4) the presence of normoblasts, which are nucleated erythrocytes of varying degrees of immaturity, and (5) the presence, in some cells, of a single Howell-Jolly body, which is a pinkish-staining, rounded body, representing a remnant of the parachromatin of the nucleus after the chromatin has been dissolved in or extruded from the cell. The more important signs of pathologic regeneration are (1) basophilic stippling, which is due to precipitation of the basophilic spongioplasm by a circulating toxin; (2) the presence of megaloblasts, which are immature, nucleated cells of the primitive generation of erythrocytes; (3) the presence of multiple nuclear buds, which are evidences of beginning karyorrhexis in the nucleated erythrocyte, and (4) multiple Howell-Jolly bodies.

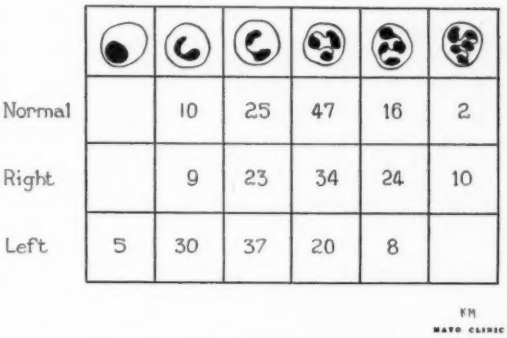

Fig. 1. Lobation of nucleus of the neutrophil with percentage of cells found in the normal, in a left shift and in a right shift.

In addition to a study of the structural changes of the erythrocytes, morphologic study of the leukocytes is of great importance, particularly in regard to lobation of the nucleus of the neutrophilic leukocyte. Other morphologic changes in the leukocytes, such as those produced by toxicity, cannot be considered in a paper of this scope. In recent years, the terms "Schilling count," or "right

shift" and "left shift," have received considerable mention in the literature. This is best shown in Figure 1, which illustrates the distribution of the cells according to the number of lobes in the nuclei of the neutrophilic leukocytes. One distribution is that found in the blood of a normal person. Another distribution is that found in the blood of a patient who had a condition which occasioned a shift to the left; that is, an increase in the proportion of neutrophilic leukocytes of which the nuclei had a small number of lobes. The third distribution illustrated is that found in the blood of a patient who had a condition which occasioned the opposite picture, or a shift to the right. The shift to the left is seen in many conditions, particularly in infections, and is regarded as an indication of immaturity of the cell, or of the effect of a toxin on the chromatin in the nucleus. The degree of change from the normal is used as a diagnostic as well as prognostic sign.

In the study of secondary types of anemia, two important procedures are essential. One is elimination of the presence of organic disease, particularly of obscure organic disease. One condition which should be emphasized is chronic loss of blood from the gastro-intestinal tract. As has been pointed out by Giffin and Watkins, this has been associated with carcinoma of the stomach, duodenal ulcer, malignant growths of the small bowel, inflammatory lesions and benign ulcer of the small bowel, benign ulcer of the cecum, and polyps of the colon. In addition to elimination of organic disease, a clinical classification of chronic secondary anemia is essential. The types of anemia secondary to known organic disease or hemorrhage obviously are not considered. Giffin and Watkins have suggested a clinical classification of obscure types of secondary anemia. The types they recognize are those due to chronic hemorrhage, obscure malignant growths, chronic infection, dietary and other deficiencies and, in addition, a type in which the anemia at present must be regarded as indeterminate or idiopathic.

We have followed the morphologic classification of Watkins. The great majority of cases of idiopathic secondary anemia fall into two groups. In the first group, there is a proportionate reduction in the value for hemoglobin and the number of erythrocytes, giving a color index of approximately one. Morphologically, for the most part the erythrocytes are well filled with hemoglobin. If the reticulated erythrocytes are increased in number, and polychromatophilia and anisocytosis of macrocytes and normocytes predominate, the bone marrow is hyperactive and the anemia is probably due to chronic loss of blood or destruction of blood. If, on the other hand, there is predominance of degenerative features, such as poikilocytosis, anisocytosis evident by the presence of normocytes and microcytes, lack of regenerative activity, and low proportion of reticulated erythrocytes, it is obvious that there is hypofunction of the bone marrow. Treatment of the latter type of anemia should be directed toward stimulation of the bone marrow. In the second group there is reduction in hemoglobin and normal or nearly normal erythrocytes, giving a low color index. The percentage of reticulated erythrocytes is normal or slightly increased. Morphologically the outstanding feature is the hypochromasia of the erythrocytes, the cells having a pale, washed-out appearance. There may also be slight polychromatophilia and anisocytosis of the regenerative type. The leukocytes, as a rule, appear normal. In this type of anemia production of cells appears to be normal; the dysfunction is in the synthesis of hemoglobin. Whether or not the type of treatment can be determined by examination of the smears is yet to be shown. However, it seems reasonable that one should endeavor to supply the elements considered necessary in the synthesis of hemoglobin.

Although most cases of pernicious anemia may be diagnosed clinically, morphologic study of the blood is of great value, for in our experience certain features, when present, are diagnostic. The erythrocytes give evidence of generalized macrocytosis. The individual cells stain more deeply than normal, due to increased thickness of the cell and not to increased hemoglobin per unit of cell, as has been suggested by many authors. Other features, which may or may not be present, are polychromatophilia, anisocytosis, nucleated erythrocytes (both normoblasts and megaloblasts), basophilic stippling, and Howell-Jolly bodies. One of the most characteristic fea-

tures of the blood picture is found in the neutrophil. There is increase in the number of lobes of the nucleus, associated with thinning and stranding of the individual lobes. With macrocytosis and definite increase in lobation of the nucleus of the neutrophil, together with thinning and stranding of the individual lobes, there can be but little doubt that one is dealing with pernicious anemia. These changes do not necessarily hold for all stages of the disease, since there may be few signs, when the blood is nearly normal, or when the patient is under treatment.

In direct contrast to the picture seen in pernicious anemia is that of hemolytic jaundice. Here there is generalized microcytosis, with many of the cells spherical. The spherical microcytes are recognized by the absence of the pale center such as is seen in the normal, biconcave erythrocyte. In addition to these features, there is almost always marked regenerative activity, as is seen by increase in the proportion of reticulated erythrocytes, as well as by the other signs of physiologic regeneration, and especially by the presence of occasional large oval macrocytes. Naturally, the amount of regenerative activity noted is dependent on the stage of the disease and the degree of anemia. From recent observations it seems possible that there may be a form of hemolytic anemia in which the features just named may not be present.

There are three conditions in which study of the blood is the most valuable single diagnostic aid: (1) aplastic anemia, (2) leukemia, and (3) infectious mononucleosis. Persistently low percentages of reticulated erythrocytes or their absence, lack of other signs of regeneration of erythrocytes, and leukopenia with a high proportion of lymphocytes, are practically characteristic of aplastic anemia. Repeated examinations of the smears should be made before arriving at any definite conclusion.

The morphologic characteristics of the cells in acute and in chronic leukemia may be considered together. The outstanding features are varying degrees of immaturity of the leukocytes. Depending on the degree of immaturity, as well as on the proportion of immature cells to mature cells, the forms of leukemia may be classified into two types. In the acute type, the myeloblast or stem cell predominates; in chronic types, the mature cells are in the majority, but a small proportion of immature cells is present, some of which may be stem cells. It must be emphasized that not all cases of leukemia are associated with an increased number of leukocytes. Normal counts or leukopenia may be observed in association with acute types of leukemia, particularly in the acute types of leukemia of childhood. In a few cases in which there is leukopenia at the onset of the disease leukocytosis develops later.

Infectious mononucleosis is known under a variety of other names, such as acute benign lymphadenosis, benign lymphocytosis, or glandular fever. Since, clinically, this disease simulates leukemia in many respects, study of the smears is of particular importance. The characteristic feature of the blood is the maturity of the lymphocytes. Many of the atypical forms vary in size, form of nucleus, and staining reaction. Leukocytoid forms are frequently seen. One outstanding feature of the nuclei of these cells is the gradual transition between the chromatin and parachromatin which is so characteristic of the mature lymphocyte. As mentioned before, study of the smears over a period of some time is necessary to establish the diagnosis.

Purpura hemorrhagica may be confused with aplastic anemia and acute leukemia. Examination of the blood smear from a patient with purpura hemorrhagica distinguishes this condition from acute leukemia by the absence of immature leukocytes. The presence of reticulated erythrocytes and other regenerative signs characteristic of activity of bone marrow distinguish it from aplastic anemia. A normal differential count is the rule, rather than leukopenia and the high proportion of lymphocytes seen in aplastic anemia.

Agranulocytic angina is another condition in which a morphologic study of the blood smear, although not diagnostic, is of value. By daily examination of the smears there is found progressive decrease in the proportion of neutrophilic leukocytes. In those cases which end fatally, there is generally decrease in the number of lymphocytes toward the termination of the illness.

SUMMARY

The most important morphologic features of the blood in secondary anemia, and the more common forms of blood dyscrasia have been briefly considered. Morphologic examination of the blood should not be used as an absolute diagnostic criterion, but should be regarded as a valuable diagnostic and clinical aid.

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COAGULATION CONDITIONS AND BACTERIAL EFFICIENCY OF PRELIMINARY WATER TREATMENT

The United States Public Health Service has recently announced the results of certain experimental studies relating to coagulation conditions and bacterial efficiency of preliminary water treatment. The studies recorded in this report are concerned with the effects of (a) the period of sedimentation, (b) the method of applying coagulant to the raw water, (c) the hydrogen ion concentration of the coagluation reaction, and (d) the density of coagulant added to the raw water, on the bacterial efficiency of coagulation-sedimentation as a preparatory treatment of water for rapid sand filtration and, incidentally, on the efficiency of the entire process of rapid sand filtration.

The experiments were carried out during portions of the three years, 1926, 1927, and 1928, at a fully equipped experimental rapid sand water filtration plant of 160,000 gallons daily capacity, designed to typify, as nearly as possible, current large-scale practice in this process of water purification, but with certain additional features incorporated in the plant for experimental purposes.

The results of the study yielded the following main conclusions:

(1) Substantial gains in the bacterial efficiency of coagulation-sedimentation resulted from prolongation of the nominal sedimentation period up to 8 or 9 hours, and measurable gains with periods up to 12 hours.

(2) Variations in the hydrogen ion concentration in the coagulation reaction from 5.6 to 6.9 produced little effect on the efficiency of coagulation-sedimentation. The efficiency became sharply diminished, however, with hydrogen ion concentration values exceeding 7.0 and slightly improved with hydrogen ion concentration values approaching 5.5.

(3) The bacterial efficiency of double-stage coagulation, with two separate stages of sedimentation, was consistently greater than that of single-stage coagulation with one stage of sedimentation. The observations indicated, however, that with the same total amount of coagulant and the same total period of sedimentation, little if any difference was observable between the results shown by double-stage and single-stage coagulation when carried out in conjunction with two separate states of sedimentation.

(4) A fairly consistent relation was shown between the amounts of coagulant added to the raw water and the resulting bacterial efficiency, both of coagulation-sedimentation and of this state in conjunction with filtration. This relationship was found to hold irrespective of raw-water turbidity or bacterial content, though it was more apparent when the turbidity and bacterial numbers were higher. Measurable gains in efficiency were shown with increases in coagulant density ranging up to 5 grains per gallon.

The general conclusion reached from the foregoing series of experiments was that the bacterial efficiency of rapid sand filtration processes can be increased very materially by means of longer periods of sedimentation and larger amounts of coagulant than ordinarily are used in current water purification practice. The economical limit of sedimentation appears to be reached somewhere between 8 and 12 hours, with little gain in efficiency beyond the upper limit of time stated.

FURTHER OBSERVATIONS ON THE TREATMENT OF PERNICIOUS ANEMIA WITH GASTRIC TISSUE OF SWINE*

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IN November, 1929, I presented at the meeting of the Minnesota Society of Internal Medicine the results of feeding gastric tissue of swine to patients who had pernicious anemia.[1] In all cases there was increase in the numbers of reticulocytes, followed by increase in the number of mature erythrocytes and in the values for hemoglobin. The number of leukocytes also was increased in most instances.

Feeding of gastric tissue was suggested by the work of Castle and Loche, who gave muscle meat to a normal subject and, after they had caused the subject to vomit, they gave the vomitus to patients who had pernicious anemia. They thus brought about improvement in blood and symptoms, such as occurs after treatment with liver. My demonstration that approximately 26 per cent of a large series of blood relatives of patients who had pernicious anemia lacked free hydrochloric acid in the gastric content served further to fix attention on the stomach as a possible etiologic factor in the disease. Also, the well known fact that practically all patients who have pernicious anemia lack free hydrochloric acid in the gastric content suggested that the stomach was in some way connected with the etiology of the disease, and that the feeding of gastric tissue might supply some unknown element lacking in the stomachs of patients who have the disease. While my method of administration and preparation of the material was being perfected and any possible harmful effects of feeding the raw material were being investigated, Sturgis and Isaacs, and Sharp reported the results of independent work with desiccated stomach. Since then Wilkinson has reported work also done independently with raw and dried gastric tissue.

My results with raw and dried stomach were in all respects similar to those reported by Sturgis and Isaacs, and by Sharp, so that I was able to corroborate their work at an early date. Wilkinson's work with raw and dried gastric tissue gave results of a similar nature. In six cases which I reported[2] in November, 1929, the results were similar to those obtained by feeding liver or its extract. Because of the unfavorable age of the patients treated and because when most of the patients started treatment the number of erythrocytes was relatively high, the average increase was not quite so high as is found in the average patient treated with liver or its extract. The average increase in number of erythrocytes in the group of six patients was approximately 1,000,000 in an average of twenty-seven days. The number of reticulocytes, generally accepted as a criterion of regeneration of erythrocytes, increased in one instance to 35.6 per cent of the total number of erythrocytes, and the highest percentage of reticulocytes obtained in the individual cases reached an average of 11.7 per cent.

My conclusion, at that time, was that the material had an effect on the blood and the symptoms of patients who had pernicious anemia similar to that of liver or its extract. Since that time I have carefully observed thirty-five other patients in the hospital and have fed various preparations of raw and dried gastric tissue. My results with these additional cases amply corroborate the view expressed in the earlier paper, that the effect is similar to that obtained with liver or its extract, and this was also the view of Sturgis and Isaacs, of Sharp, and of Wilkinson.

Among patients whose erythrocytes numbered less than 2,000,000 in each cubic millimeter of blood (Table 1) when treatment was instituted, the number increased from an average of 1,450,000 to an average of 2,920,000 in twenty-three and fifty-eight hundredths days, or 432,000 each week. Among those who started treatment when the number of erythrocytes was more than 2,000,000 in each cubic millimeter of blood (Table 2) the number increased from an average of 2,710,000 to 3,570,000 in twenty-two and ninety-four hundredths days, or 292,000 each week.

*From the Division of Medicine, The Mayo Clinic, Rochester, Minnesota. Read before the Minnesota State Medical Association, Duluth, July 14 to 16, 1930.

TABLE 1

PROGRESS OF PATIENTS WHOSE ERYTHROCYTES NUMBERED LESS THAN 2,000,000 IN EACH CUBIC MILLIMETER OF BLOOD AT BEGINNING OF TREATMENT

Case	Days in hospital	Beginning of treatment		End of treatment	
		Hemoglobin, per cent (Dare)	Erythrocytes in each cubic millimeter of blood, millions	Hemoglobin, per cent (Dare)	Erythrocytes in each cubic millimeter of blood, millions
1	27	15	0.75	55	2.78
2	29	20	0.93	58	2.81
3	27	38	1.62	58	3.32
4	34	34	1.37	65	3.78
5	27	45	1.97	75	3.80
6	27	18	1.07	55	2.77
7	24	40	1.95	60	3.29
8	20	42	1.96	68	3.36
9	21	30	1.32	68	3.06
10	21	40	1.88	70	2.98
11	35	30	1.42	50	2.73
12	25	35	1.50	70	3.14
13	27	20	1.04	44	1.86
14	33	38	1.66	68	3.84
15	21	28	1.31	68	3.25
16	25	28	1.21	40	1.62
17	22	40	1.59	75	3.08
18	15	32	1.86	38	2.67
19	21	8.05 gm.	1.63	65	3.37
20	30	35	1.53	58	3.23
21	11	20	1.13	48	2.07
22	13	35	1.53	45	2.09
23	22	26	1.19	50	3.16
24	9	38	1.42	40	2.07
Average	23.58	31.6	1.45	57.9	2.92

TABLE 2

PROGRESS OF PATIENTS WHOSE ERYTHROCYTES NUMBERED BETWEEN 2,000,000 AND 4,000,000 IN EACH CUBIC MILLIMETER OF BLOOD AT BEGINNING OF TREATMENT

Case	Days in hospital	Beginning of treatment		End of treatment	
		Hemoglobin, per cent (Dare)	Erythrocytes in each cubic millimeter of blood, millions	Hemoglobin, per cent (Dare)	Erythrocytes in each cubic millimeter of blood, millions
25	21	48	2.30	72	3.00
26	45	60	2.67	70	3.95
27	26	48	2.20	65	3.37
28	30	48	2.01	75	3.45
29	33	50	2.25	68	3.37
30	34	43	2.14	60	3.56
31	21	50	2.20	75	3.38
32	14	65	2.79	70	4.28
33	16	8.8 gm.	2.40	75	3.28
34	13	55	2.41	75	3.36
35	20	60	2.55	73	3.57
36	41	75	3.57	83	4.20
37	18	70	3.62	80	4.20
38	10	70	3.49	70	3.21
39	32	58	3.14	70	3.69
40	5	75	3.34	80	3.73
41	11	73	3.00	75	3.22
Average	22.94	59.3	2.71	72.7	3.57

The number of reticulocytes increased in all cases, reaching a maximum of 65.8 per cent in one case.

There has been the same improvement in general symptoms that was reported in the earlier paper. The neurologic symptoms responded well in some instances but not in all. The minor neurologic symptoms usually have improved or disappeared, but in the more advanced cases the patients have been less responsive to treatment.

In most instances the stools were examined for parasites before and after treatment to avoid overlooking possible transmission to the patient of a parasitic disease by the use of the raw material. Disease has not been transmitted in any known instance.

As a result of the treatment of these additional cases I feel safe in asserting that the results with feeding of gastric tissue are similar to and apparently equal to those obtained with liver or its extract. Presentation of detailed study of these cases would be voluminous and must be reserved for another contribution.

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TREND OF MENINGOCOCCUS MENINGITIS IN THE UNITED STATES

At a recent conference of State and Territorial Health Officers with the Public Health Service, it was pointed out by representatives of the Service that reports received from State Health Officers for the past five years indicate that there has been a progressive increase in the number of cases of meningococcus meningitis that have been recorded. It is true that the actual number of cases are not large when compared with the total population. It is significant, however, that each year there has been an increase over the preceding year, and that this rise has been continuing for five years.

When the prevalence of meningococcus meningitis increased during the period of 1915 to 1917, the number of cases rose in Europe before the movement occurred in the United States, but after the World War the number of cases did not rise noticeably in Europe until 1929, and then the increase was not general and the rates were not high.

Incomplete reports for the first three months of 1930 show rates higher than the normal for England and Wales, Scotland, The Netherlands, and Poland, but no figures from Europe have been found indicating a general increase in the prevalence of this disease comparable with that in the United States.

There was an outbreak of meningococcus meningitis early this year in the Anglo-Egyptian Sudan, and reports from the French Protectorate of Morocco show some increase in cases in March. Recent reports from Asia do not show anything unusual in the prevalence of the disease. Canada has reported comparatively few cases, but there has been a slight increase in incidence in Mexico.

The nomenclature relative to meningococcus meningitis has been changed several times, the disease having been variously designated cerebrospinal meningitis, epidemic meningitis, and other similar terms. For this reason earlier figures are not exactly comparable with the later ones.

The total number of cases of meningococcus meningitis reported throughout the United States for the past five years is as follows:

Year	Cases
1925	1,859
1926	2,226
1927	3,204
1928	5,781
1929	9,660

In considering these figures the difficulties of obtaining accurate reports should be borne in mind.

Since March, 1930, the reported prevalence of meningococcus meningitis in the United States has been lower than it was in the corresponding months of 1929.

THE INTRAVENOUS ADMINISTRATION OF SODIUM ISO-AMYL-ETHYL BARBITURATE (SODIUM AMYTAL) FOR THE ALLEVIATION OF PAIN DURING LABOR

A REPORT OF FORTY-SIX CASES

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MANY drugs have been used for the alleviation of pain during labor. All of them have failed in a greater or lesser degree to fulfil the requirements of an ideal anelgesic and anesthetic, namely, that pain shall be abolished or greatly alleviated; that the course of labor shall not be interfered with or prolonged; that the mother shall not be harmed; that the baby shall not be harmed.

The pharmacologic actions of the barbituric acid derivatives in animals and in man have given promise that one or more of them might be of value in obstetrics, and several reports have been made of their use. Cleisz[1] reported favorably on the intravenous administration of somnifene (diethyl-allyl-iso-propyl barbiturate of diethylamine) during labor. Delmas and Roume[2] reported unfavorably on their experience with the same drug. More recently Robbins et al.[3] reported on the administration of sodium amytal (sodium iso-amyl-ethyl barbiturate) in one hundred cases of labor, mostly by the intravenous route. Drabkin et al.[4] reported the use of the same drug administered rectally in thirty-three obstetrical patients.

The intravenous route of administration of sodium amytal was chosen in this series of cases. It is less painful than intramuscular administration. The patient obtains immediate relief from labor pains. The variable factor of intestinal absorption is eliminated. Furthermore, the effect of the drug is noted instantly and, Weiss[5] having pointed out that there are marked individual variations in the response of patients to identical doses, a suitable dose can be more accurately determined during administration.

The use of drugs other than sodium amytal was avoided in this series. Exceptions to the rule are noted in the tables. Toward the end of the second stage, however, small doses of pituitrin were occasionally given and 1 c.c. of pituitrin was given intramuscularly at the beginning of the third stage followed by 1 c.c. of ergot intramuscularly as soon as the placenta had been delivered.

The drug was supplied† in pyrex ampules containing either 0.5 or 1.0 gm. (7½ or 15 gr.). Immediately before administration, it was mixed with sterile distilled water from an accompanying ampule to make a ten per cent solution, which was clear in one to three minutes. It was advised that solutions not clearing in five minutes and having an opalescent appearance indicating the presence of colloidal material be discarded. All solutions used in this series, however, cleared promptly.

When a patient was in active labor and rectal examination revealed 3 cm. dilatation of the cervix, she was told that she would be given relief from pain at any time that she desired. The solution was then injected intravenously at the rate of 1 c.c. (0.1 gm. or 1½ gr.) per minute in doses of .250 gm. (3¾ gr.) to .666 gm. (10 gr.), the patient usually being asleep by the time 3 or 4 c.c. had been administered. A first dose of 0.5 gm. (7½ gr.) was found to be most effective for a woman weighing about 68 Kg. (150 lbs.).

When signs of returning consciousness, such as complaint of increasing pain or rational responses to questions, were noted, a second and even a third dose of the drug varying from .333 gm. (5 gr.) to .500 gm. (7½ gr.) was administered. The drug was also repeated for increasing restlessness, without, however, any lasting quieting effect being observed. The average interval between doses, when the drug was repeated once or twice during the labor, was two and one-third hours. The longest interval was seven hours, and the shortest, one-half hour. The average interval from the time of the first administration of the drug to delivery was four

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†I am indebted to Eli Lilly and Company for supplying the drug used in this study.

hours in thirty-two primiparæ and two hours in fourteen multiparæ. The longest interval was ten hours, and the shortest, fifteen minutes.

A total dosage as high as 1.233 gm. (18½ gr.) was given during one labor. A subsequent determination of dosage in relation to body weight in twenty-four cases showed that .003 gm. (1/20 gr.) to .007 gm. (1/9 gr.) per Kg. in one dose produced varying degrees of analgesia and amnesia; and that .007 gm. (1/9 gr.) to .009 gm. (1/7 gr.) per Kg. in one dose produced complete amnesia for two to three hours.

Amnesia in twenty-six (70.3 per cent) of the thirty-seven cases which received 7½ gr. or more was classified as complete from the time of administration until immediately after delivery. Most of the patients then regained consciousness, although several of them had amnesia lasting one or two hours after delivery. Eight patients (21.6 per cent) were classified as having partial amnesia. Two of these patients (case 16, table 1 and case 33, table 2) had complete amnesia lasting for three hours after administration, when they regained consciousness and the drug was not repeated. Three others (cases 39, 40 and 45, table 2) had complete amnesia for one and three-fourths to two and one-half hours before delivery. One patient (case 38, table 2), a nervous primpara who received 7 and 6 gr. six and one-fourth and four hours before delivery, and in whom good amnesia was noted, afterwards stated that the labor had been very painful. Three patients (8.1 per cent) had slight amnesia. Patients who appeared to be conscious were questioned as to pain and were asked to remember numbers. The day following delivery they were asked to recall the numbers and were questioned concerning events of the labor, usually with little or no remembrance of what occurred after administration of the drug. Some of them remembered such incidents as being moved from bed to a wheel cart or to the delivery table. All patients, including those who had partial amnesia, were disoriented as to time. Most of the patients, including all of the multiparæ, were enthusiastic about the relief obtained.

The character of contractions during the first stage was not noticeably affected by the drug except in one case in which the administration of 5 gr. to a patient who had been in labor ten hours, immediately stopped contractions, which were resumed two hours later, the patient then delivering in one hour (case 3, table 1). In several patients, voluntary efforts during second stage contractions were not noted, but these cases terminated spontaneously without apparent delay. In five patients (cases 16, 18, 24, 25 and 29) to whom the drug was administered late in the second stage, termination of labor seemed to be hastened. The average duration of labor in thirty-two primiparæ was fifteen hours, in fourteen multiparæ, nine and one-fourth hours.

Eleven patients (24 per cent) of the entire series were extremely restless soon after administration of the drug and it was necessary to restrain them during contractions. One patient became maniacal and walked about the room in spite of forcible attempts to restrain her. Six patients (13 per cent) were moderately restless, and six (13 per cent) were slightly restless. Restlessness was usually present only during contractions or when the patient was disturbed. It was the most objectionable result of the procedure, for the patients who were restless required constant watching by nurses and were difficult to control during examinations and preparation for delivery, although they were quickly quieted by small amounts of an inhalation anesthetic after being taken to the delivery room. No relationship could be determined between the degree of restlessness and the depth of amnesia, the most restless patients having no memory of the labor or of their actions.

In all but six cases of the entire series, an inhalation anesthetic was administered at the time of delivery or toward the end of the second stage (see tables). It was noted that smaller amounts of the anesthetic were required than usual, and that the restlessness was readily controlled. The six patients who received no supplementary anesthetic were quiet during delivery, and some of them had episiotomies performed or lacerations sutured without remembering either the delivery or the perineal operation.

In seventeen cases in which the mothers' blood pressure was recorded before and after administration, nine cases (52.9 per cent) showed an average increase of 12 mm. of Hg., the greatest increase being 26 mm. and the least 2 mm.; five cases (29.4 per cent) showed an average decrease of 11 mm., the greatest decrease being 26 mm. and the least 2 mm.; and three cases (17.7 per cent) showed no change. In eighteen cases in which the pulse was recorded immediately be-

TABLE 1.—DATA ON TWENTY-TWO PATIENTS IN NORMAL LABOR TO WHOM SODIUM AMYTAL WAS ADMINISTERED INTRAVENOUSLY AT ANCKER HOSPITAL, SAINT PAUL

CASE NO.	AGE	PARITY	DURATION LABOR (HR.)	INTERVAL DRUG TO DELIVERY (HR.)	DOSAGE (GR.)	RESTLESSNESS	AMNESIA	POSITION	METHOD OF DELIVERY	ANESTHESIA	DIFFICULTY IN RESUSCITATION	RESULT FOR MOTHER	RESULT FOR BABY
1	18	I	11	2½	3¾	Slight	Partial	OLA	Spont.	CHCL3	None	Fair	Excellent
2	22	I	17½	4½	3¾	None	Partial	OLA	Spont.	CHCL3	None	Good	Excellent
3	32	VI	13	3	5	None	Partial	ODA	Spont.	CHCL3	None	*Poor	Excellent
4	19	I	14	3	6	Slight	Partial	OLA	Spont.	CHCL3	Slight	Good	Good
5	18	I	15½	4½	6	None	Complete	ODA	Spont.	CHCL3	None	Excellent	Excellent
6	26	I	14	1½	6	Extreme	Complete	ODA	Spont.	CHCL3	None	Fair	Excellent
7	29	I	21	3	6	None	Partial	OLA	Spont.	CHCL3	None	Good	Excellent
8	22	I	12	3	6	None	Complete	OLA	Spont.	None	None	Excellent	Excellent
9	20	II	17	¾	6	Moderate	Complete	OLA	Spont.	None	None	Good	Excellent
10	23	I	15	1½	7½	Moderate	Complete	OLP	Forceps	CHCL3	None	Excellent	Excellent
11	19	II	10	2	7½	None	Complete	OLA	Spont.	CHCL3	Moderate	Excellent	Fair
12	20	I	9½	3½	7½	Slight	Complete	OLA	Spont.	CHCL3	None	Excellent	Excellent
13	19	I	8	2	7½	None	Complete	ODP	Spont.	CHCL3	Slight	Excellent	Good
14	24	IV	4	2	7½	None	Complete	OLA	Spont.	CHCL3	Slight	Excellent	Good
15	24	II	11½	4½	7½	None	Complete	OLA	Spont.	CHCL3	None	Excellent	Excellent
16	18	I	6¼	4¼	7½	Slight	**Partial	OLA	Spont.	CHCL3	None	Good	Excellent
17	24	I	18	2	7½	None	Partial	OLA	Spont.	CHCL3	None	Fair	Excellent
18	21	I	19	2¼	7½	None	Complete	OLA	Spont.	CHCL3	None	Excellent	Excellent
19	29	I	14	2½	7½	None	Complete	OLA	Forceps	CHCL3	Moderate	Excellent	Fair
20	19	I	19	10	†15	Moderate	Complete	OLA	Spont.	None	Slight	Excellent	Good
21	22	I	11	7	†15	Extreme	Complete	ODP	Spont.	None	Slight	Fair	Good
22	30	I	20	6	‡15	Slight	Complete	OLA	Spont.	None	None	Excellent	Excellent

* Contractions stopped for two hours.

** Amnesia complete for the first three hours. Labor induced with castor oil and quinine.

† Two doses of 7½ gr. each, 10 and 3 hours before delivery in case No. 20, and 7 and 4¼ hours before delivery in case No. 21. Morphine sulphate gr. 1/6 and scopolamine gr. 1/200 with the first dose.

‡ Three doses of 8, 3½ and 3½ gr. administered 6, 3½ and 1½ hours before delivery.

TABLE 2.—DATA ON TWENTY-FOUR PATIENTS IN NORMAL LABOR TO WHOM SODIUM AMYTAL WAS ADMINISTERED INTRAVENOUSLY AT MIDWAY HOSPITAL, SAINT PAUL

CASE NO.	AGE	PARITY	DURATION LABOR (HR.)	WEIGHT (LB.)	TOTAL DOSAGE (GR.)	FIRST DOSE (GR.)	INTERVAL TO DELIVERY (HR.)	SECOND DOSE (GR.)	INTERVAL TO DELIVERY (HR.)	RESTLESSNESS	AMNESIA	POSITION	METHOD OF DELIVERY	ANESTHESIA	DIFFICULTY IN RESUSCITATION	RESULT FOR MOTHER	RESULT FOR BABY
23	36	III	4½	141	7½	7½	2½	0	0	Extreme	Complete	SLA	Extract.	CHCL3	None	Excellent	Excellent
24	39	III	6	170	7½	7½	¼	0	0	Moderate	Slight	OLA	Spont.	CHCL3	Slight	Poor	Good
25	30	II	19	169	7½	7½	½	0	0	Extreme	Slight	OLA	Spont.	CHCL3	None	Poor	Excellent
26	26	I	7	132	7½	7½	1½	0	0	None	Complete	OLA	Spont.	CHCL3	None	Excellent	Excellent
27	26	I	43	145	7½	7½	5	0	0	None	Complete	ODP	Spont.	CHCL3	None	Excellent	Excellent
28	26	I	11¼	156	7½	7½	4	0	0	None	Complete	OLA	Spont.	CHCL3	None	Excellent	Excellent
29	42	III	3	167	7½	7½	½	0	0	None	Complete	OLA	Spont.	CHCL3	Slight	Excellent	Good
O30	30	II	3	135	7½	7½	1	0	0	None	Complete	OLA	Spont.	CHCL3	None	Excellent	Excellent
O31	38	IV	3½	192	*7½	7½	1	0	0	None	Partial	OLA	Spont.	N2O	None	Good	Excellent
32	29	III	20	155	7½	7½	4	0	0	None	Complete	ODA	Forceps	CHCL3	None	Excellent	Excellent
33	18	I	16	133	9½	9½	5¼	0	0	Moderate	**Partial	ODP	Spont.	CHCL3	None	Good	Excellent
O34	23	I	22¾	150	10	10	4½	0	0	None	Complete	OLA	Spont.	N2O	None	Excellent	Excellent
35	33	IV	8¾	175	10	10	3¼	0	0	None	Complete	ODA	Spont.	CHCL3	None	Excellent	Excellent
36	20	I	12	141	12	7	2½	5	1	Extreme	Slight	ODP	Spont.	CHCL3	Moderate	Poor	Fair
37	28	I	10½	123	12½	7½	2½	5	2	Extreme	Complete	OLA	Spont.	CHCL3	None	Good	Excellent
O38	23	I	11¾	144	13	7	6¼	6	4	Extreme	Partial	ODP	Spont.	N2O	Extreme	Poor	†Poor
O39	26	I	11	187	13½	7½	5	6	1¾	None	††Partial	ODP	Spont.	N2O	None	Good	Excellent
O40	26	I	16½	179	15	7½	6¾	7½	2½	Extreme	††Partial	OLA	Spont.	N2O	Moderate	Fair	Fair
41	27	I	18¾	144	15	7½	3½	7½	2½	None	Complete	OLA	Forceps	N2O	Extreme	Excellent	Poor
42	30	I	10½	169	15	7½	8	7½	6¼	Moderate	Complete	ODP	Spont.	CHCL3	Slight	Excellent	Good
43	40	III	6¼	131	17	7	5	‡5	2¾	Extreme	Complete	ODA	Spont.	None	None	Good	Excellent
44	22	I	12½	157	17½	10	4¼	7½	2¼	Extreme	Complete	OLA	Forceps	Ether	Moderate	Good	‡‡Fair
O45	28	I	29½	138	18½	7½	7½	‡5	5	Slight	††Partial	OLA	Forceps	N2O	None	Good	Excellent
46	24	I	7½	135	17½	10	2¾	7½	2	Extreme	Complete	OLA	Spont.	CHCL3	None	Good	Excellent

* Morphine sulphate gr. 1/6 1¼ hours before delivery.

** Amnesia complete for the first 3 hours.

† Baby was 3 weeks premature, weighing 5 lbs. 10 oz., and delivered ODP persistent. Morphine sulphate gr. ¼ 3½ hours before delivery.

†† Amnesia complete after the second dose in cases No. 39 and 40, and after third dose in case No. 45.

‡ A third dose of 5 gr. was given 1½ hours before delivery in case No. 43, and a third dose of 6 gr., 3 hours before delivery, in case No. 45.

‡‡ Mother had a severe pre-eclamptic toxemia.

fore, and at intervals after administration and until delivery, ten cases (55.5 per cent) showed an average increase of 12 beats per minute, the greatest increase being 28 and the least 5; three cases (16.7 per cent) showed an average decrease of 8, the greatest decrease being 10 and the least 4; and five cases (27.8 per cent) showed no change. In ten cases in which the respirations were recorded before and after administration, three cases showed an average increase of 7 per minute, varying from 4 to 12; two cases showed a decrease of 4 and 6; and five cases showed no change. The changes in blood pressure, pulse and respiration were, obviously, those common to normal labor. There was no suggestion of the decreased blood pressure, the moderately increased pulse, and the reduced rate of respiration constantly observed by Weiss[5] in patients with acute poisoning due to barbituric acid derivatives.

Postpartum observation disclosed no increase in bleeding, no restlessness after delivery, no increase in the incidence of nausea and vomiting. The patients were drowsy for several hours after delivery. Upon regaining consciousness, they did not complain of fatigue, although the striking well-being of patients following the administration of scopolamine-morphine analgesia was not observed.

The effects of the drug on the mothers in the thirty-seven patients who received 0.5 gm. (7½ gr.) or more of sodium amytal were summarized and evaluated, taking in consideration the following factors: (1) completeness of amnesia; (2) degree of restlessness; (3) interference with the progress of labor. In twenty-one cases (56.8 per cent), the results in the mother were classified as excellent; in nine cases (24.3 per cent), the results were good; in three cases (8.1 per cent), fair; in four cases (10.8 per cent), poor.

In nineteen cases in which the fetal heart tones were observed before and after administration of sodium amytal, eleven cases (57.9 per cent) showed an average increase of 12 beats per minute at some time before delivery, the greatest increase being 22, and the least 4; three cases (15.8 per cent) showed an average decrease of 17 beats per minute, the greatest decrease being 22, the least 10; and five cases (26.3 per cent) showed no change. These changes were considered to be well within normal limits.

Resuscitation of the babies was necessary in fifteen out of the forty-six cases (32.6 per cent). Of these, eight babies (17.4 per cent) were only slightly apneic and breathed after clearing the air-passages and rubbing the back; five (10.9 per cent) were moderately apneic and were given alpha-lobeline intramuscularly, after which breathing quickly became established. The apnea seemed to be due to an increased sluggishness of the respiratory center, for when breathing had once been established following stimulation, most of the babies cried lustily. Two babies (4.3 per cent) were asphyxiated and, in addition to drug stimulation, required tubbing before they breathed. One of the asphyxiated babies (case 38, table 2) was a premature infant who delivered O D P persistent; the other was delivered by a moderately difficult mid-forceps operation (case 41, table 2).

The average loss of weight after birth in the twenty-four cases recorded in table 2 was 6.8 ounces. Three babies who delivered spontaneously and weighed from 8 pounds 9 ounces to 9 pounds 7 ounces at birth, each lost 13 ounces. The average time during which weight loss occurred in the twenty-four cases was 3.4 days. All babies were given complementary feedings until and unless the mother's milk supply was adequate. Fifty per cent of them had regained their birth weight when discharged from the hospital on the ninth to the twelfth days. No relationship could be established between difficulty in resuscitation and weight change. No babies were sleepy and unable to nurse for several days after delivery as noted by Delmas and Roume[2] with their use of somnifene.

SUMMARY

The slow intravenous administration of freshly prepared, clear, ten per cent solutions of sodium amytal in doses of .500 gm. (7½ gr.) to .666 gm. (10 gr.) to thirty-seven women of a series of forty-six, after labor had become well established, produced analgesia and amnesia for periods of two to three hours. When the drug was repeated in doses of .333 gm. (5 gr.) to .500 gm. (7½ gr.) at average intervals of two and one-third hours until delivery, satisfactory amnesia was produced in all but 8.1 per cent. One-fourth of the patients were somewhat restless as a result of the medication, and one-fourth of them were extremely restless until quieted by small amounts of an inhalation anesthetic given before and during delivery. In the whole series,

there was no apparent slowing of labor except in one case, and in several cases labor seemed to be hastened. Changes in maternal blood pressure, pulse and respiration were those of normal labor. Third stage and postpartum complications were not increased. Fetal heart rates were not abnormally altered, but one-third of the babies were more or less apneic and required stimulation to establish respiration. Postnatal infant behavior and weight curves were not altered from the normal.

CONCLUSIONS

1. When the dosage and intervals are individualized, the intravenous administration of sodium amytal during the latter half of the first stage and during the second stage of normal labor induces satisfactory amnesia in nine out of ten cases.
2. Labor is rarely, if ever, prolonged by its use and may sometimes be hastened.
3. There is no evidence of harm to the mothers.
4. Slight to extreme restlessness results from its administration in one-half of the patients and is an objectionable feature of the procedure.
5. Restlessness can be controlled toward the end of the second stage and delivery facilitated by the use of an inhalation anesthetic, of which lesser amounts than usual need be administered.
6. One-third of the babies are somewhat apneic at birth, apparently due to a torpidity of the respiratory center induced by the drug, and require stimulation to establish respiration.
7. No other deleterious effects of the drug are observed in the postnatal behavior or weight changes of the babies.

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MORE MISBRANDED NOSTRUMS

The following products have been the subject of prosecution by the Food, Drug and Insecticide Administration of the United States Department of Agriculture which enforces the Federal Food and Drugs Act: Palatol (Parke, Davis and Company of New York City), consisting essentially of cod liver oil, malt, wild cherry, phosphates, cholesterol, alcohol, sugar and water. Halanum (The Radium Research Foundation), containing no radium and being in fact essentially a weak solution of common salt in water. Eleven Bros. Tonic (Eleven Bros. Laboratories, Inc.), consisting essentially of epsom salt, iron chloride, alcohol and water, flavored with peppermint. Phenyo-Caffein (The Phenyo-Caffein Company), consisting essentially of acetanilide, caffeine and camphor. Fenholloway Sulphur Springs Water (A. E. Jackson), containing a filthy animal and vegetable substance. Bel-Caps (W. E. Shuit), containing ammonium, iron and calcium compounds, sulphates, carbonates, chlorides, bromides, camphor, aloin, small amounts of alkaloids and plant extractives, including a laxative drug. EfeDron Hart Nasal Jelly (The Hart Drug Corporation), consisting essentially of a mucilaginous mass containing ephedrine hydrochloride, chloretone, carbolic acid, salt and water flavored with oil of cinnamon. Crane's Laxative Quinine Cold Tablets (The Crane Medicine Company), each tablet containing 8/10 grain of acetanilide with quinine and cinchonine salts and a laxative plant drug. Bromoline (The Senoret Chemical Company) consisting of coated tablets containing acetanilide, cinchonine sulphate and resinous plant material. Grip-Sules (Kingsbury and Frick), capsules containing about 1½ grains of acetanilide, about ⅓ grain of caffeine, a quinine compound and a pungent drug, such as red pepper. Numoss (The C. R. Products Company), consisting of ammonium chloride, creosote and Irish moss, flavored with oil of anise. Hogan's Old Reliable Cough Syrup (Hogan's Old Reliable Cough Drops, Inc.), consisting essentially of ammonium chloride, red pepper, chloroform, extracts of plant drugs, including licorice, squill, wild cherry and senega, with alcohol, sugar and water, and flavored with oil of anise. (Jour. A. M. A., September 27, 1930, p. 951.)

THE USE OF SODIUM AMYLETHYL BARBITURATE IN NERVOUS DISORDERS*

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IN the treatment of the various types of psychoneuroses, and also in the more profound psychotic conditions, aside from the need of a thorough understanding of the individual personality make-up, a careful analysis of the existing conflicting emotional elements, and a study of his social conditions, there is, in many instances, a real need for medicinal therapy. The relief of daytime tensional states, such as extreme degrees of depression, excitability or anxiety, the alleviation of various painful stimuli, and the production of a sufficient amount of restful relaxation and sleep at night, without too great a depressive action the next morning, all contribute a real share toward relieving the psychoneurotic or psychotic case by preventing the exhaustion which accompanies emotional tension, inhibiting the reception of painful psychic stimuli, and improving the general physical tone of the body through obtaining a proper amount of rest.

In prescribing drugs for the relief of nervousness, the alleviation of pain or the production of sleep, there is great need for the careful study of the effect of the drug, its adaptability to the purpose for which it is intended, and a most careful individualization of dosage. That a given drug may affect different individuals in various manners and degrees is probably more true with psychiatric patients as a whole than with any other type of patients with whom we may come in contact. The literature sent out by various pharmaceutical and chemical houses which are producing an almost innumerable number of products, unfortunately labelled a trade name rather than the proper pharmacological term, must not be taken for granted. If we are to use these products, we must study them carefully, and determine for ourselves by actual clinical experience when they may be of benefit to a patient, the proper dosage in each instance, and the recognition of cases where their use is contraindicated. To illustrate the variability of action and the possible misuse of these drugs, let us consider three of the most commonly used products, namely, luminal, veronal and the various bromide salts. I have frequently encountered patients who have been prescribed luminal a grain and a half three times a day, whose condition required certainly not more than a half grain three times a day. On the smaller dose they made much more rapid improvement and were able to cooperate much better with the other phases of treatment. I have seen patients who have been prescribed veronal as a sedative during the day and luminal to produce sleep. Other cases have been prescribed allonal as a daytime sedative and bromides as an hypnotic. To me, these are examples of poorly adapted medication. In my experience, I have found luminal to be a much better sedative than a soporific, though if given in large enough doses, it will produce sleep, but will also be more depressing the next morning than many other drugs that might have been given in a smaller dose. I have found veronal too depressing to be used as a daytime sedative, yet a fairly efficient soporific, but requiring careful adjustment of dosage in order to avoid severe depressing reaction the following morning. I have found allonal a good analgesic, a poor sedative and a rather undependable hypnotic unless given in a dosage that almost certainly produces a depressed feeling upon awakening. I consider bromide salts useful as sedatives, of no value as analgesics and unsatisfactory as hypnotics unless given in large doses. I do not use bromides except over very short periods, on account of the tendency to produce gastric irritation and skin eruption.

Practically all these drugs, unless properly prescribed, have the possibility of harmful results. The literature contains numerous references to the production of a toxic rash from the use of luminal. Some cases will develop a rash from a very small dose, others only on

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large doses or prolonged usage. I have personally known a case that presented a rather typical picture of lethargic encephalitis, and was so diagnosed by three different physicians, that proved to be chronic luminal poisoning and cleared up on withdrawal of the drug. Veronal, if taken in large doses over a sufficient length of time, is extremely depressing, is altogether too readily obtained at drug stores, and frequently used by nervous psychotic individuals to permanently escape from their worldly cares and troubles. Toxic psychoses produced by overly large doses of bromides are not at all uncommon, and often deprive the individual of usefulness and adaptability to everyday life for a period of many months. I have in mind a patient who entered the hospital for an operation for a chronic ailment, who was very nervous in anticipation of the operation. By way of preparation, to settle her nerves, she was given sixty grains of bromides for four doses at quite frequent intervals over a two-day period. At the end of this time she was greatly excited, hallucinated and delusional. It was almost four months before she returned to her normal state.

From the foregoing, it would seem apparent that there is an opportunity for improvement on our present medicinal therapy of nervous states. There is a need for further judicious experimentation and careful clinical observation. The realization of this led me to investigate the possible adaptation of sodium amylethyl barbiturate. The successful use of this drug in the field of surgery in producing narcosis sufficiently deep to allow major surgical operations to be performed without any serious after-effects, indicated that it might well be a most useful agent in the field of psychiatry. A search of the literature has failed to reveal the experience of others who may have been using the drug with the same objective, although there are several articles dealing with its use in surgery.

This drug is the sodium salt of iso-amylethyl barbituric acid. It has been used rather extensively for several years as a general anesthetic in experimental pharmacological and physiological work. More recently, it has been prepared so that when protected against moisture and carbon dioxide, a stable compound, suitable for intravenous use, is obtained. It may be used intravenously, intramuscularly, orally or rectally. When prepared for intravenous use, it should be a five or ten per cent weight volume solution. The solution is affected by exposure to air, therefore it should be used within a short time after preparation, especially if given intravenously. If the solution is not perfectly clear after a four or five minute standing, it should not be used. The dose when used intravenously for controlling convulsive states such as are found in epilepsy, alcohol poisoning, meningitis and other convulsive states of a like nature, is from four to twelve grains. If repeated at frequent intervals, subsequent doses should be smaller, as it has been found to have a certain cumulative action, especially if given intravenously. However, this has not been my experience when the drug is given orally. When it is administered intravenously, close observation to determine the first signs of loss of consciousness affords valuable information regarding the additional amount which will be required to obtain the desired effect. Most patients who lose consciousness after the administration of three or four grains do not require as much additional amount of the drug as those who require five to seven grains before losing consciousness. Shortly after starting the injection of the drug, the patient gets drowsy and soon falls into a very deep sleep. Respirations are decreased in amplitude and there is a slight degree of cyanosis sometimes present. Respiration may become very difficult, cyanosis extreme, blood pressure fall dangerously low and the pulse become thready if the injection is given too rapidly or in too large a dose. The injection should not be more rapid than one cubic centimeter per minute. I have not personally experienced this reaction in any of my patients, due to giving the drug too rapidly. However, in one of my cases, a hospital interne administered the drug and the patient's respiration, blood pressure and pulse rate became alarming, though he rapidly regained a normal state following a short period of artificial respiration and cardiac stimulation.

This drug should not be given intravenously nor in large doses, otherwise, in cases suffering from generalized arteriosclerosis, hypertension or any pulmonary disease. It should also be given cautiously following large doses

of morphine or to patients who are sensitive to morphine and drugs of a similar nature. Patients who are known to be hypersensitive to other barbituric acid derivatives should not be given this drug. It has been my observation that its intravenous administration in the group of cases with which we are dealing, is indicated only in convulsive states and in cases where the patient's coöperation is not sufficient to allow the administration of the drug orally.

In the oral administration of the drug, it is best given in capsule form, as it has a bitter taste and is not well taken in powder form. In most cases where oral administration is possible, from six to twelve grains of the drug are usually sufficient to obtain sleep over a period of from five to ten hours. This is a smaller dose range than has been recommended for oral administration in surgical use. However, in the non-surgical case, the desired narcosis need not be so deep, therefore the dosage may be smaller. There is another point of difference between the non-surgical patient and the surgical patient. It has been observed that where this drug is given, followed by other anesthesia and operation, there is a considerable period of excitement upon the patient's awakening, followed by a further period of lethargy. This has not been my experience in giving it to non-surgical patients. This would indicate that the period of excitement and prolonged lethargic condition was not due to the drug itself, but due to a combination of factors such as the addition of other anesthetic agencies, surgical shock or other physiological reaction. Where oral or intravenous administration is not possible, the drug may be administered intramuscularly or rectally. I have had no experience with rectal administration of this drug. However, I have obtained very satisfactory results with intramuscular injections. When given intramuscularly, only a small amount, three or four cubic centimeters, should be injected at any one point, otherwise the point of injection will be quite painful and unnecessary tissue reaction result. When injected intramuscularly in small amounts, after a period of two or three days, there is no evidence of any tissue reaction nor is the area painful.

I have used this drug in the various types of cases that one encounters in the usual psychiatric practice. I have used it, to a large extent, for its sleep producing action. However, I have attempted to determine whether or not, in smaller doses, it might be valuable as a sedative. It is a most excellent drug in controlling convulsions when given intravenously. I have also used it in four cases of idiopathic epilepsy. These cases have been observed over a period of from three to four months. The average dose has been one and one-half to three grains two or three times a day. These cases were all previously on luminal therapy. In two cases there was no perceptible change in the frequency or severity of the convulsions. In one case the convulsions were more severe and more frequent than when on luminal therapy, and in one case the patient reported longer intervals between convulsions and some improvement in his general feeling of well-being. However, these cases have not been observed over a sufficient length of time to draw definite conclusions as to its value in epilepsy. As a daytime sedative in psychoneurotic cases, it has been my observation that the drug, unless given in very small doses, has too great a soporific action, and if given in small doses its action is very transient.

As a soporific in psychoneurotic cases, and also in psychotic cases attended by marked excitement and depression with severe insomnia, when given in carefully adjusted doses, it is a real aid in obtaining sufficient restful sleep with a minimum degree of depressant action.

THE PROBLEM OF DISEASE OF THE PARANASAL SINUSES*

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DISEASE of the sinuses is as old as man and has been dealt with continuously throughout the ages, as examination of skulls of ancient civilizations reveals. The generally prevalent pessimistic idea at this time that disease of the sinuses is not amenable to well directed treatment is not based on facts but usually has been spread by word of mouth. It is, I believe, true that we are now emerging from an era in which an overenthusiastic profession chose to assign disease of the sinuses to many symptoms referable to the head in particular, and to the body in general. For this reason, perhaps, many destructive intranasal and extranasal operations were performed without affording relief of symptoms, but more often resulting in adding new symptoms to the old. If operation was not performed, the patient would be occupied by home-treatment measures, and thus had many reasons to be introspective and pessimistic. Fortunately, the physiologic and pathologic causes of symptoms are better understood now and a much more rational, scientific and conservative era is in sight.

For better orientation, it might be useful to recall that the paranasal sinuses are a part of the upper respiratory tract, and, although their function is not well defined, they still are present and occasionally become diseased. The tract has a definite function in respiration performed by virtue of the highly specialized nearly automatically controlled mucous membrane. The function involves warming, moistening, and cleaning the air breathed. It is obvious that under certain environmental or climatic conditions the response would be variable. The environmental reaction will not be considered here. The maxillary, frontal, and sphenoid sinuses develop after birth and in certain instances, for unexplained reasons, do not develop symmetrically in pairs. The ethmoid sinuses are usually present at birth.

All sinuses communicate with the nose by small openings in the lateral wall underneath the middle turbinate except the posterior ethmoid and sphenoid sinuses, which empty into the postnasal space. The lining membrane is continuous with and similar to that of the interior of the nose except that it is thinner, and it has fewer glands and fewer blood spaces. It is easy to explain, then, why the sinuses may be involved in infections of the upper respiratory tract. Perhaps, if the nose and appendages were more often spoken of as the upper respiratory tract, their function, and the physiologic and pathologic phenomena relating to them would be better understood. Infections of the upper respiratory tract are so frequently encountered and usually so self-limiting that they are not often given serious consideration, although from an economic standpoint such infections are significant. Infections of the lower respiratory tract have always received serious consideration.

The direct etiologic factor in disease of the sinuses, as has been intimated, is the severe infection of the upper respiratory tract. The sinuses become involved by contiguity and continuity, and because of the inadequate size of the opening into the nose, resolution is protracted or does not occur until well directed interference is instituted. The maxillary sinus may become involved by contiguity to an infected tooth. The occurrence of such involvement has been variously estimated as between 12 and 25 per cent.

The use of various aqueous solutions in nasal irrigations and sprays has a time-honored precedent, but as early as 1844 it was pointed out that for physiologic and pathologic reasons, they were not without great danger. Such solutions denude the surface of the membrane of its greatest protective mechanism, and produce pathologic changes. The only excuse for their use is that irrigations have offered a convenient method of clearing the nasal passages.

The habit of blowing the nose may have much to do with causing infections of the sinuses by forcing infected material into the sinuses. Animals have infection of the sinuses as the result of infections of the upper respiratory tract but not as a result of blowing the nose.

Underlying the immediate etiologic factor, however, is the large general problem of hygiene, allergy, dietetics and preventive medicine. Each

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might well be the subject of discussion. I would suggest, however, that the frequency of "head colds" is not nearly so dependent on the particular anatomic arrangement or condition of the structures encountered in the upper respiratory tract, as is hygiene, including environment, mode of living, occupation, manner of dress and diet. It has been shown experimentally that animals may be made less resistant to infections of the upper respiratory tract by certain diets, and that by change of diet all symptoms can be made to disappear. It is seen, then, that the problem of disease of the sinuses is not entirely that of the rhinologist but begins with the guidance of the general profession.

The severity of the symptoms in acute sinusitis, so far as pain and discomfort are concerned, is due to the intense congestion of the membranes. Not until this congestion is relieved by the natural process of secretion will relief be afforded. To hasten the onset of secretion is the aim of treatment at this stage. The most effective means has been found to be general measures, such as rest in bed in semi-upright position, steam inhalations, hot moist packs over the face, saline catharsis, and coal-tar products by mouth. The severe symptoms usually last over a period of forty-eight hours, or the time usually necessary for the secretory mechanism to function properly. After this period shrinkage of the nasal membranes induced by topical applications of astringents followed by gentle suction will markedly relieve the symptoms, and will hasten resolution. Surgical measures at this stage are dangerous, for an avenue for extension of infection toward the meninges is opened. Most patients with acute sinus trouble will go on to an uneventful convalescence under this regimen.

If certain symptoms, such as localized pain, occurring usually in the morning hours and subsiding at midday, and copious purulent secretion continues to be troublesome after a period of a week or ten days, depending on the severity of these symptoms, one may decide to continue local treatment or to use certain conservative surgical measures. In case such treatment does not favorably affect the disease, it becomes chronic, and cases may be grouped as follows: (1) serous or, as commonly called, catarrhal, (2) purulent, (3) hyperplastic, or polypoid, and (4) a combination of these. The problem, then, rightly belongs to the rhinologist.

It may be said that the signs and symptoms of disease of the sinuses are usually quite definite and that there is little difficulty in making a diagnosis. Roentgen examination has become increasingly important as an adjunct diagnostic aid in disease of the sinuses. Whoever interprets the picture must be conversant with the anatomy, the anatomic variations and pathologic changes of the paranasal sinuses. The roentgenogram can be very misleading. Roentgenograms are usually more accurate in the diagnosis of conditions other than suppuration, such as tumors, foreign bodies, osteomas, and changes in bone. When roentgenograms are used in conjunction with other diagnostic aids, however, their aid is invaluable.

Again the diagnosis of disease of the sinuses may be quite difficult and the accurate site of the sinus or sinuses involved may require repeated eliminative examinations in the course of several days of observation. For instance, it might seem easy to say, in conjunction with definite physical changes in the middle meatus, that the ethmoid sinus is involved. When one remembers that the maxillary and frontal sinuses empty into the middle meatus and the presence of this pathologic secretion may cause visible physical changes of the membranes without involvement of the ethmoid sinus itself, it becomes necessary to decide definitely whether or not the ethmoid sinuses are involved. Many times, in my experience, counter-draining the maxillary sinus into the inferior meatus has caused the appearance of the middle meatus to change completely, and operation on the ethmoid sinus was thus avoided. It is difficult to understand how isolated ethmoid cells could become involved without signs, except in cases in which they are infected from an infected lacrimal sac. Patients frequently present themselves with the complaint that they have disease of the sinuses, either self-diagnosed or because of some symptom an acquaintance may have suggested was due to disease of the sinuses.

In general, it may be said that well directed intranasal operations will clear up disease of the sinuses in most cases, if serious pathologic changes have not occurred in the mucous membrane and bone. The principle of treatment involved is drainage and ventilation.

When profound pathologic changes have taken place in the mucous membrane and bone,

the radical external operations must be employed. In this instance, the principle of treatment involved is the removal of the disease.

In the past, the radical operations of the frontal sinus resulted in seriously deforming scars but at present this often can be avoided. From my own standpoint, the hyperplastic disease of the ethmoid is the most difficult to deal with satisfactorily.

The results in general are satisfactory. It must be admitted, however, that it is not always possible to effect a restitutio ad integrum status of the parts. This fact, perhaps, explains why certain patients have post-operative symptoms not due to disease but to altered physiologic reactions.

It should be pointed out that pain and headache caused by other intranasal disorders than disease of the sinuses, or eye strain, migraine, neuritis of the nasal ganglion, brain tumors, constipation, toxemia, and so forth, are not benefited by operations of the sinuses no matter how well performed. Vasomotor rhinitis, usually the manifestation of some general disturbance, or allergy, endocrine, or other causes, has been frequently treated as sinusitis, with obviously unsatisfactory results. Symptoms referable to the reaction of the mucous membrane to its environment, such as stuffiness under certain climatic conditions, dropping of mucus into the pharynx, or coughing, are not explained on a basis of disease of the sinuses.

The relation of disease of the sinuses to the focal infection theory of causation of disease is important. I believe that the sinuses too often have been considered important foci, even when there were no manifest signs of sinusitis. There has been a radical change of opinion within the last five years in regard to posterior ethmoid and sphenoid sinuses as the causative factor in retrobulbar neuritis. However, the sinuses may be the definite cause of focal infection. We all have had such cases. A recent review of 400 consecutive cases of frank chronic suppurative sinusitis gave a surprisingly low incidence of syndromes of focal infection. It seems obvious that frank sinusitis when present should be taken care of although it may not be the focus causing the trouble. If treatment for such conditions is to be rational and well directed, all foci of infection must be investigated.

SUMMARY

There is nothing mysterious or mystical about disease of the paranasal sinuses. The results of well directed treatment are satisfactory. There is no reason why the general prevalent idea that "once a sinus disease, always a sinus disease" should obtain. A better understanding of the function, physiology and treatment of the paranasal sinuses will overcome this attitude.

SYNTHETIC THYROXINE

The A. M. A. Chemical Laboratory recalls that Kendall isolated thyroxine from the thyroid gland and that he considered it to have a constitution which later was found to require revision and that in the U. S. Pharmacopeia thyroxine is defined as an active principle obtained from the thyroid gland. Attention is called to the fact that while spelled in the Pharmacopeia without a final "e" the substance is basic in character and must be spelled thyroxine. Three years ago, Harington and his co-workers arrived at the conclusion that the Kendall formula was not correct. Later this conclusion was confirmed by the preparation of thyroxine synthetically. Synthetic thyroxine has been prepared by pharmaceutic laboratories abroad and one brand, Synthetic Thyroxine-Roche, has been submitted to the Council on Pharmacy and Chemistry. The Laboratory found this brand to comply with the standards which it had elaborated and the Council admitted this product to New and Non-official Remedies for the reason that the pharmacopeial definition does not apply to the synthetic substance. (Jour. A. M. A., August 16, 1930, p. 484.)

PALSY OF THE CRANIAL NERVES*

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IN an endeavor to evaluate the significance of palsy of the cranial nerves, a study was made of the record of 213 cases that were selected at random. In these cases, partial or complete palsy of the cranial nerves was referable to 474 cranial nerves. These are classified in tables 1 and 2. The problem naturally divided itself into the recognition of various degrees and types of such palsy, and as accurate an interpretation of them as possible. The clinical diagnoses were proved by necropsy in four cases only. Strong corroborative evidence was furnished by biopsy in twenty-five cases and by operation in thirteen cases. Clinical tests (chiefly serologic and roentgenographic) were supportive in eighteen cases. In all others, the pathologic and etiologic agents were suspected from evidence varying from an epithelioma plainly in view to the association of palsy with trauma or infection. That such evidence can be misinterpreted is exemplified by observations at necropsy in one case in which there had been palsy of a series of cranial nerves. This was thought to be due to extension of a tumor. It was found that the neoplasm had eroded a small hole through the skull, permitting infection to enter and cause the localized meningitis which was responsible for the palsy of the cranial nerves.

With the foregoing plan, each cranial nerve will be considered in a way suggestive of the natural clinical approach to problems of the nerve. Only the most fundamental facts concerning lesions of cranial nerves can be presented.

FIRST OR OLFACTORY NERVE

The first nerve consists of many fine nerve fibers entering the upper pole of the nasal cavity through the cribriform plate subserving the function of smell. From a partial lesion of the nerve the patient might not notice anything. From a complete lesion of this nerve the patient might or might not be aware of the absence of smell (anosmia). To elicit a complete lesion of this nerve the examiner uses volatile substances such as camphor, benzine and oil of wintergreen, and tests one nostril while the other is closed. The complete inability to smell these substances is far more significant than the failure properly to recognize them. If the sense of smell seems to be absent, the following possibilities must be eliminated before cranial nerve palsy can be considered: (1) nasal obstruction; (2) scars in the nose from disease or operation; (3) the presence of ozena, and (4) congenital absence of smell.

Conditions that may cause palsy of the cranial nerves are (1) brain tumor involving the basifrontal region; (2) endothelioma of the olfactory groove; (3) fracture of the base of the skull, and (4) meningitis.

SECOND OR OPTIC NERVE

The second nerve, the largest cranial nerve, enters the orbital cavity through the optic foramen and by means of the eye subserves the functions of vision for color and form. From a partial lesion of this nerve the patient might or might not be especially aware of defective vision although a very slight lesion of the maculopapillary bundle would express itself as defective visual acuity (amblyopia). A complete lesion of the nerve produces blindness (amaurosis). To elicit a partial lesion the ability to see very small colored objects at a given distance, to read various standardized print, to count fingers, to see moving objects, or to perceive light are tests which are employed. Various grades and types of defect of vision were presented by Lillie. In the case of amblyopia, or defect of vision, the following possibilities, among others, must be eliminated before a lesion of the optic nerve can be established: (1) refractive errors; (2) opacity of media of eye; (3) disease or destruction of macula, retina, or choroid; (4) glaucoma; (5) defect of intelligence; (6) disease of optic pathways back of optic chiasm; (7) congenital defect, such as color blindness; (8) defect of muscles necessary for binocular vision, and (9) hysteria.

Conditions that may cause palsy of the optic nerves are: (1) multiple sclerosis, in which the

*From the Section on Neurology, The Mayo Clinic, Rochester, Minnesota. Read before the Minnesota State Medical Association, Duluth, July 14 to 16, 1930.

optic nerves are often affected; (2) retrobulbar neuritis, which sometimes proves later to be multiple sclerosis; (3) tumor of the basifrontal region, causing injury to the optic nerves; (4) pituitary tumor; (5) basilar meningitis (syphilitic, tuberculous or meningococcic); (6) secondary optic atrophy from choked disks from intracranial pressure, and (7) primary optic atrophy.

Table 1

PALSY OF THE CRANIAL NERVES CAUSED BY LESIONS OF 474 CRANIAL NERVES IN 213 PATIENTS

	Nerve																						
	1st		2nd		3rd		4th		5th		6th		7th		8th		9th and 10th		11th		12th		Total
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	
Partial			9	12	35	38	6	5	20	26	15	21	15	29	12	14	9	13	10	7	8	12	316
Complete	3	3	3	3	12	9	5	1	6	3	19	17	15	14	8	12	6	7	3	6	1	2	158
Total	3	3	12	15	47	47	11	6	26	29	34	38	30	43	20	26	15	20	13	13	9	14	47
Bilateral	3		8		16				3		9		5		3		4		2				53

Table 2

PALSY OF THE CRANIAL NERVES (PARTIAL OR COMPLETE): 213 PATIENTS

Lesion suspected*	Nerve												Total
	Patients	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth and tenth	Eleventh	Twelfth	
Tumors													
Primary	54	4	9	16	9	31	25	21	21	16	15	14	181
Secondary	12			4	1	6	2	4	2	6	2	4	31
Intracranial inflammation													
Unknown type	52		5	20	3	7	16	24	3	5	1	2	86
Syphilis of the central nervous system	17		6	17	1	1	3	3	2	2	2		37
Tuberculosis	10		2	10		1	6	3	1		1	1	25
Injury													
Fracture of the skull	10		2	1			5	9	7				24
Other types	24	2	2	9	2	4	1	5	1	1	5		32
Vascular lesions	15		1	9	1	5	7	2	3	3		1	32
Congenital defect or anomaly of development**	2			2				2					4
Miscellaneous	17			6			7		6	2		1	22

* Evidence supporting the diagnosis afforded by necropsy in four cases, biopsy in twenty-five, operation in thirteen and clinical tests (chiefly serologic and roentgenographic) in eighteen.
** These may or may not be due to lesion of the nerve.

THIRD OR OCULOMOTOR NERVE

The third nerve enters the orbital cavity through the superior orbital fissure and supplies the muscles to elevate the lids and to move the eyes upward, downward and toward the nose. The inferior oblique muscle moving the eye upward and outward is also supplied by it. In addition the pupillary constrictor and ciliary muscle for accommodation are supplied by fibers associated with it. Partial lesion would be likely to cause diplopia with the patient looking in various directions, and might cause ptosis of the eyelid and fixation of the pupil. With complete lesion the patient would notice complete ptosis, diplopia in looking up, down or to the nasal side, fixation of the pupils to light, and difficulty in reading without corrective glasses, due to failure to accommodate. The types of diplopia due to complete paralysis of the third nerve were presented by Fuchs.[1] The examiners would notice in the case of a complete lesion on elevating the ptosed lid the inability to rotate the eye upward, downward or nasalward, and fixation of the pupil to light and accommodation (Fig. 1). In cases of apparent partial or complete paralysis of

the third nerve the following conditions must be eliminated: (1) congenital ptosis (usually bilateral); (2) the apparent ptosis due to Horner's syndrome, the result of paralysis of the cervical sympathetic nerves; (3) disorders of the muscle of the eye (muscular dystrophy and atrophy) which simulate palsy of the cranial nerves; (4) asymmetric positions of the eyes; (5) disease of the nucleus of the nerve and (6) disease of the midbrain producing weakness of conjugate movements of the eye.

Palsy referable to the third cranial nerve seems to be most commonly caused by inflammation or injury at the base of the brain, such as that due to syphilis or to tuberculosis.

THE FOURTH OR TROCHLEAR NERVE

The fourth nerve enters the cranial cavity through the superior orbital fissure and supplies the superior oblique muscle which rotates the eye downward and inward. Partial paralysis of this nerve may produce diplopia. Complete paralysis would do little more. Patients with this lesion sometimes tilt their heads to compensate for the oblique diplopia. Paralysis of this nerve is not detectable by the examiner without special meth-

TABLE 3

CONDITIONS THAT MAY BE CONFUSED WITH PALSY OF THE CRANIAL NERVES

First Nerve	Fourth Nerve	Eighth Nerve
Nasal obstruction	Lesions of the other ocular motor nerves	Obstructive deafness
Operative scars in nose		Mental deficiency
Ozena	**Fifth Nerve**	Schilder's disease
Congenital absence of smell	Paresthesia as seen in psychosis	Disease of the midbrain
Second Nerve	Syringobulbia	Pineal tumor
Refractive errors	Lesions of the brain stem	**Ninth and Tenth Nerves**
Opacity of media of eye	Lesions of the upper cervical portion of the cord	Hoarseness from laryngitis
Disease of macula, retina or choroid	**Sixth Nerve**	Difficulty in swallowing from nasal or esophageal obstruction
Glaucoma	Defects of muscle	Medullar lesions
Mental deficiency	**Ocular asymmetry**	**Eleventh Nerve**
Disease of optic pathways	Disease of the brain stem	Arthritis of neck and shoulder
Congenital defects, color blindness and so forth	**Seventh Nerve**	Monoplegia
Defect of muscles necessary for binocular vision	Nuclear lesion	**Twelfth Nerve**
Hysteria	Lesion of cortical motor area	Nuclear lesion, as in bulbar palsy
Third Nerve	Asymmetry of the face	Pseudobulbar palsy
Congenital ptosis	Hemiatrophy of the face	Sore tongue
Horner's syndrome	Hemihypertrophy of the face	
Muscular dystrophy and atrophy	Edema of one side of the face	
Ocular asymmetry	Contracture of one side of the face	
Disease of the nucleus of the nerve	Muscular disorders of the face	
Disease of the midbrain		

TABLE 4

CONDITIONS THAT MAY CAUSE PALSY OF THE CRANIAL NERVES

First Nerve	Fourth Nerve	Eighth Nerve
Basifrontal tumor	Inflammation or injury of the base of the brain	Tumor of the cerebellopontine angle
Endothelioma of olfactory groove	**Fifth Nerve**	Basilar meningitis
Fracture of the base of skull	Tumor of the cerebellopontine angle	Disease of the inner ear
Residual of meningitis	Tumor of the gasserian ganglion	Familial degeneration
Second Nerve	Tumor of the nasopharynx	Fracture of base of skull
Multiple sclerosis	**Sixth Nerve**	Toxic neuritis (mumps, tobacco, alcohol)
Retrobulbar neuritis	Intracranial pressure	**Ninth and Tenth Nerves**
Basifrontal tumor	Otitis media	Retroparotid tumor
Basilar meningitis	Lesions at the base of skull	Injury, as in thyroidectomy
Secondary optic atrophy	**Seventh Nerve**	**Eleventh Nerve**
Primary optic atrophy	Inflammation (Bell's palsy)	Injury
Third Nerve	Tumors or inflammation at the base of the brain	Retroparotid tumor
Inflammation or injury of the base of the brain	Fracture of the base of the skull	Inflammation
	Peripheral neuritis	**Twelfth Nerve**
		Retroparotid tumor

ods such as the colored glasses for differentiating images, and even then with some difficulty.

Lesions of this nerve, especially isolated ones, are not common and their detection is rare. The nerve is subject to the same disease processes as the third nerve, with which it is closely associated.

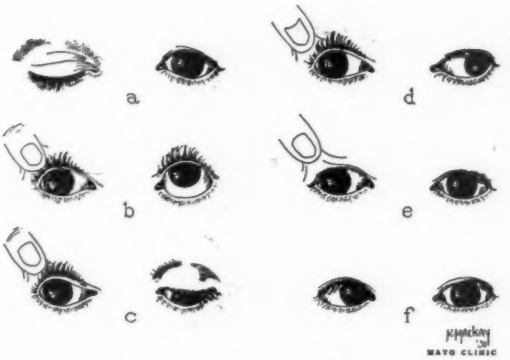

Fig. 1. *a* to *e*, Manifestations of complete palsy of the right third cranial nerve: *a*, ptosis; *b*, position of the eyes on looking upward; *c*, position of the eyes on looking downward; *d*, position of eyes on looking to the left; *e*, position of eyes on looking straight forward; *f*, appearance of the eyes in complete palsy of the right sixth cranial nerve on looking straight forward.

FIFTH OR TRIGEMINAL NERVE

The fifth nerve, the largest except the optic and composed of three divisions, sends the branches of the first division, or ophthalmic nerve, into the orbital cavity through the superior orbital fissure; the second division, or maxillary nerve, leaves the skull through the foramen rotundum, and the third division, or mandibular nerve, leaves the skull through the foramen ovale. The nerve supplies fibers carrying pain, temperature and tactile sensibility to the face and fore part of the scalp as well as to the mucous membrane of much of the oral and nasal cavities and tongue. It also has a motor root supplying the muscles of mastication. From a partial lesion of the nerve a patient might notice numbness of the face on the side of the lesion. A complete lesion would cause the patient to notice complete anesthesia of the face and there might be some trouble in chewing food on the side of the lesion. If the lesion has existed for a considerable time, there may be trophic disturbances of the eye, wrinkling of the cornea or corneal ulcers on the side of the lesion. In case of complete lesion, the examiner would notice a defect of the masseter, and possibly of the temporal muscle and the lower jaw would deviate to the paralyzed side because of paralysis of the pterygoid muscle (Fig. 2). The patient would not feel pin pricks, cotton wool, or heat and cold

Fig. 2. Manifestations of palsy of the motor branch of the fifth nerve; *a*, right pterygoid palsy, jaw deviating to the side of the lesion; *b*, atrophy of the left masseter.

stimulation over the side of the face. The cornea would be so insensitive that it could be touched with cotton or a pin head without the patient's awareness. In cases of apparent lesions of the fifth nerve the following possibilities must be eliminated: (1) paresthesia of the face such as is seen in certain cases of psychosis; (2) syringobulbia (cavity in the brain stem); (3) other lesions of the brain stem, and (4) lesions of the upper cervical portion of the spinal cord.

Lesions (usually partial) of the fifth nerve that may cause palsy are: (1) tumor of the cerebellopontine angle, which is one of the most common causes, (2) complete lesion of the fifth nerve in cases of tumor of the gasserian ganglion, and (3) tumor of the nasopharynx.

SIXTH OR ABDUCENS NERVE

The sixth nerve enters the orbital cavity through the superior orbital fissure. It is a motor nerve to the external rectus muscle of the eye. From a partial lesion of the nerve the patient might notice diplopia in looking in some directions. From a complete lesion the patient would have diplopia. In case of complete lesion the examiner would notice internal strabismus on the side of the lesion, and to demonstrate the defect the patient should be asked to look to the extreme side of the lesion, in which case the eye would not move toward the external canthus. If the sixth nerve seems to be paralyzed, the following conditions must be eliminated: (1) de-

fects of muscle, (2) asymmetry of the eyes, and (3) disease of the brain stem.

Palsy referable to the sixth nerve may be caused by (1) intracranial pressure, (2) sometimes by otitis media (Gradenigo's syndrome), and (3) sometimes by lesions at the base of the skull.

Fig. 3. *a*, Complete palsy of the left facial nerve; *b*, inability to wrinkle left side of forehead; *c*, inability to close left eye; *d*, inability to show teeth on left side; *e*, inability to whistle out of left side of mouth; *f*, inability to contract left platysma.

SEVENTH OR FACIAL NERVE

The seventh nerve leaves the skull through the stylomastoid foramen. It has a long circuitous course. It supplies the muscles of the face and ear and the taste fibers to the anterior two-thirds of the tongue. If it were partially paralyzed, the patient would notice inability to use the facial muscles naturally. In complete paralysis the patient would not be able to move the muscles of the paralyzed side, such as in wrinkling the forehead, closing the eye, whistling, showing the teeth, or drawing the corners of the mouth down (Fig. 3). If the lesion is complete, sometimes patients notice loss of taste on the side of the lesion. The effects of the lesion are most obvious to the examiner in asking the patient to perform these movements. Taste can be tested by placing sour, bitter, salty, or sweet objects on the anterior two-thirds of the tongue, and on the side of the lesion, and having the patient point to a chart with the names of the tastes on it. When there appears to be a lesion of the seventh nerve, the following conditions should be eliminated: (1) lesion of the nucleus of the nerve; (2) lesion of the facial region of the motor area of the brain (involves only lower part of face); (3) asymmetry of the face; (4) hematrophy of the face; (5) hemihypertrophy of the face; (6) edema of one side of the face; (7) contracture of one side of the face; (8) disorders of the muscles per se, such as muscular dystrophy and myasthenia gravis.

If palsy referable to the seventh nerve is present, the commonest causes are: (1) inflammation (Bell's palsy); (2) tumor or inflammation involving the base of the brain; (3) fracture of the base of the skull, and (4) sometimes in severe peripheral neuritis bilateral palsy of the seventh nerve which is sometimes difficult to recognize but is usually associated with other types of palsy of the cranial nerves.

EIGHTH OR VESTIBULO-ACOUSTIC NERVE

The eighth nerve subserves the functions of hearing and of equilibrium. From a partial lesion of the caustic portion of the nerve the patient may notice defect in hearing. Complete lesion produces absolute deafness. The examiner may, by rough tests, such as watch tick, elicit defects. Newer methods have recently been developed for more accurately measuring the defects of hearing. Partial or complete lesion of the vestibular portion may not be noticed by the patient, but while a lesion of this nerve is being produced, vertigo may be prominent. In cases of apparent palsy referable to the eighth nerve, the following conditions must be eliminated: (1) obstructive deafness; (2) defective intelligence; (3) Schilder's disease; (4) disease of the midbrain, and (5) pineal tumor.

Conditions that may cause palsy of the cranial nerves are: (1) tumor (unilateral) of the cerebellopontine angle; (2) basilar meningitis; (3) inflammatory disease of the inner ear; (4) familial degeneration of the eighth nerve; (5) fracture of the base of the skull, and (6) toxic neuritis of the eighth nerve, such as occurs during mumps and after excessive use of alcohol and tobacco.

NINTH OR GLOSSOPHARYNGEAL NERVE AND TENTH OR VAGUS NERVE

The ninth and tenth nerves leave the skull through the jugular foramen. It seems impossible at present completely to distinguish the function of one of these nerves from the other. The ninth nerve supplies the taste fibers to the posterior third of the tongue, motor fibers to the stylopharyngeal muscle, and probably sensory fibers to the pharynx. The tenth nerve probably supplies motor fibers to the constrictor muscles of the pharynx and soft palate. It supplies the motor fibers to the vocal cords, and afferent and efferent fibers to many of the thoracic and abdominal visceral structures. It is doubtful whether a patient would notice symptoms from a partial or complete isolated lesion of the ninth nerve. A lesion of the tenth nerve would result in hoarseness and inability to swallow properly.

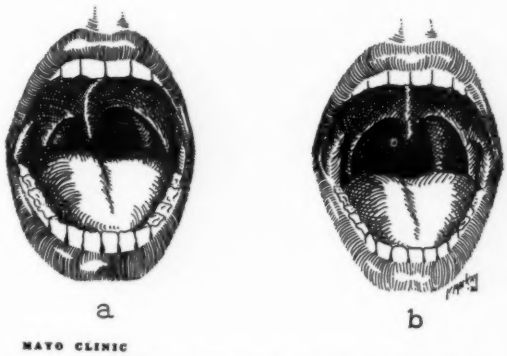

Fig. 4. Manifestations in palsy of the ninth and tenth cranial nerves: *a*, palsy of the left soft palate; *b*, palsy of the right constrictor of the pharynx.

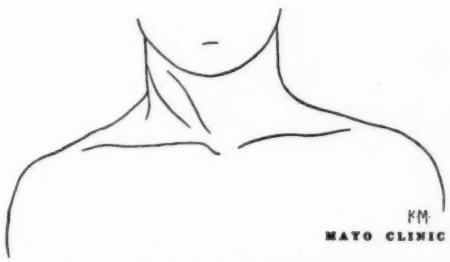

Fig. 5. Appearance of palsy of the left sternomastoid muscle. Manifestations of palsy of the eleventh cranial nerve.

The examiner could elicit weakness on one side of the soft palate by having the patient say "Ah," and of the pharyngeal muscles by putting a tongue depressor against the posterior pharyngeal wall to initiate a gag reflex (Fig. 4). In the presence of a complete lesion the laryngoscope reveals the vocal cord in the cadaveric position. If the lesions of the ninth or tenth nerve are suspected, the following conditions must be eliminated: (1) hoarseness due to laryngitis; (2) difficulty in swallowing due to an obstructive lesion of the esophagus or nasal obstruction, and (3) lesion of the medulla, such as that manifested by symptoms referable to occlusion of the posterior inferior cerebellar artery.

Conditions that may cause palsy of these cranial nerves are: (1) retroparotid tumor, or tu-

mor invading that region, and (2) injury, as in thyroidectomy.

ELEVENTH OR SPINAL ACCESSORY NERVE

The eleventh nerve makes its exit from the skull through the jugular foramen. It supplies

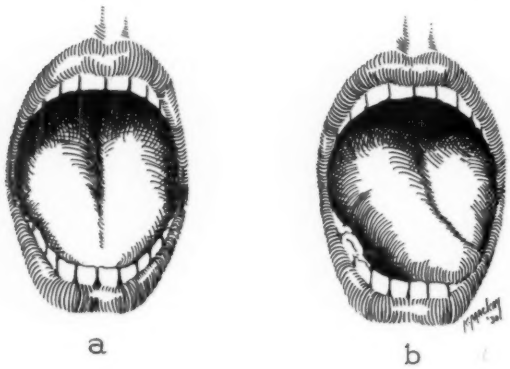

Fig. 6. Manifestation of palsy of the twelfth cranial nerve: *a*, normal tongue; *b*, palsy of the left twelfth cranial nerve, showing the tendency of the tongue to deviate to the side of the lesion.

the motor fibers to the upper portion of the trapezius and to the sternomastoid muscles. Partial or complete lesions would be known to the patient by inability to elevate the shoulders, as in shrugging (Stewart). The examiner would notice weakness and lack of prominence to the sternomastoid muscle by turning the patient's head away from the side of the lesion (Fig. 5). In cases of apparent lesion of the eleventh nerve, the following conditions should be eliminated: (1) arthritis of the shoulder or neck, and (2) monoplegia.

Palsy of this cranial nerve may be caused by (1) injury, not infrequently; (2) retroparotid tumors, and (3) inflammation.

TWELFTH OR HYPOGLOSSAL NERVE

The twelfth nerve makes its exit from the skull through the canalis hypoglossi. It is a motor nerve and supplies fibers to muscles of the tongue. If the nerve is partially paralyzed, the tongue is not so facile in its movement as normal, especially to the side opposite the lesion. If complete lesion is present, the tongue protrudes to the paralyzed side (Fig. 6). The patient notices difficulty in talking. The examiner may elicit weakness of the tongue by having the patient push the tongue into each cheek as far, and with as much force, as possible. Conditions that must be eliminated before palsy of the cranial nerves can be considered are: (1) nuclear lesions, as in bulbar palsy; (2) pseudobulbar palsy, and (3) sore tongue.

If a lesion of the twelfth nerve is present, retroparotid tumor is the most probable cause.

COMMENT

Complete paralysis of an isolated nerve (except the fourth) supplying the muscles of the eye produces a relatively simple and easily detected clinical picture. Partial or complete paralysis of more than one nerve may make the resulting clinical syndrome difficult to interpret.

There may be much pain in the distribution of a nerve such as the fifth or ninth, without demonstrable defect in the sensory or motor functions of these nerves.

During and following the epidemic of influenza in 1918, more patients were seen with partial palsy of the cranial nerves (especially of the third, fourth and sixth nerves) than had been seen previously. Many of these patients recovered but in some instances typical sequelæ of epidemic encephalitis developed.

Often the first symptom of nasopharyngeal tumor is pain in the region of the distribution of the fifth nerve and this nerve usually is involved early. Such tumors are probably responsible for more cases of palsy of the cranial nerves than any other cause; the palsy usually is confined to the side of the tumor. Retroparotid (mixed) tumors usually involve the ninth, tenth and eleventh nerves and sometimes the twelfth nerve, and produce the Jackson, or jugular foramen syndrome. Tumors of the acoustic portion of the eighth nerve almost invariably involve the fifth nerve on the side of the lesion.

Syphilis and tuberculosis involve especially the nerves to the optic muscles. Fractures through the base of the skull frequently involve the seventh and eighth nerves, although others may be affected as well.

Although it may not be easy to determine in the case of a motor nerve whether the muscle, nucleus of the nerve, or upper motor neurone is involved, the site of the lesion can often be determined. If the muscle is involved, the texture of the muscle as determined by palpation or biopsy may be of value. Also muscles in widely

separated regions may exhibit signs of disease. If the nucleus of the nerve is involved, muscular atrophy and fibrillary twitchings are usually seen in the muscles supplied by the nerve. In case a lesion of the upper motor neurone is suspected, the presence of signs elsewhere caused by the upper motor neurone, such as Hoffman's or Babinski's signs, may help to cast evidence in favor of such a conclusion. In the case of lesions of the sensory nerves, one must always rely on the subjective sensations and reactions of the patient. These are full of pitfalls, the avoidance of which, nevertheless, becomes an art of the experienced neurologist.

Thus if palsy of the cranial nerves seems to be present, its presence should be proved, if possible. After its presence is fairly well established the etiologic agent may be strongly suspected or even fairly well proved by the aid of information derived from careful history taking, by a careful examination of the whole body, and by the aid of well selected clinical tests. There is no place where careful day-by-day observation is so essential.

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STUDY OF INFLUENZA MORTALITY IN SIX EPIDEMICS 1920-1929

The Public Health Service has recently completed a study of influenza mortality in six epidemics. This study is based on weekly death rates from respiratory diseases recorded as influenza and pneumonia in about 95 cities of the United States during the period 1920-1929.

From January 1, 1920, to the middle of 1929 six epidemics of more or less national extent have occurred in the United States—1920, 1922, 1923, 1926, spring of 1928, and the winter of 1928-29. Judging by the rates in the 95 cities, which seem to be only slightly higher than rates for the country as a whole, these six epidemics caused in excess of the normal or expected seasonal mortality from respiratory diseases recorded as influenza and pneumonia, approximately 250,000 deaths in the country as a whole—a total of nearly one-half as many deaths as occurred in the United States during the great pandemic of 1918-19. About one-fifth of these deaths, or 50,000, occurred during the recent epidemic of the winter of 1928-29, and two-fifths, or 100,000, occurred during the sharp epidemic of the early months of 1920.

Although these six epidemics were more or less nation-wide in extent, the various sections of the United States were by no means equally affected. In the instance of several of the smaller epidemics there appeared to be whole sections of the country that were not affected. On the other hand, certain sections of the country experienced fairly sharp epidemics in years when the rates for the country as a whole did not indicate any influenza-pneumonia deaths in excess of the median weekly rates. An example of this is an epidemic in the West South Central cities which occurred in the early months of 1925, a year when the remainder of the country appeared to be relatively free from influenza.

The point of origin and direction of progress of these six epidemics varies a great deal. Nearly every one of them arose in a different section of the country. The 1920 epidemic arose in the East North Central section and progressed very rapidly to all other sections of the country. The 1922 epidemic arose in the East, probably in the Middle Atlantic section, and the 1923 epidemic arose in the East South Central section. The 1926 and the 1928-29 epidemics arose on the West Coast, and the little epidemic of the spring of 1928 probably arose in the Mountain or West South Central section.

The rate of progress across the country varies a great deal in the different epidemics. Considering the 95 cities as a whole, however, there is more uniformity in the length of the epidemic. In 1920 the central half of the deaths occurred in a period of about 16 days. In the epidemics of 1928-29, 1922, and 1926 the central half of the deaths occurred in periods of 21, 22, and 23 days, respectively. In the small epidemic of the spring of 1928 the period was 27 days, and in the epidemic of 1923 the period was 30 days. The 1923 epidemic seems to show the least time-concentration of any of these recent outbreaks. In the case of all the other epidemics the excess rate rose and fell at about the same rate, but in 1923 the rise to the peak was considerably slower than the fall of the curve to the normal level again.

ENCEPHALITIS*

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SINCE the onset of the first great epidemic in 1917, the most characteristic feature of epidemic encephalitis has been its protean manifestation and the widespread dissemination of its involvement of the nervous system. No mere enumeration of signs and symptoms, or the orderly grouping into clinical types, can give an adequate picture of the symptomatology of this disease. The lesions giving rise to the symptoms may be scattered from the frontal pole to the conus medullaris. For that reason the grouping into clinical types of this disease has been misleading. For a brief presentation the symptoms may be grouped into general and focal during the acute stage, and the general aspects of the chronic stage considered.

Fever is present as a rule during the acute stage, but is usually of only moderate intensity —99 to 101 degrees—and of short duration. In a large majority of cases headache, either moderate or severe, is usually present. Disturbance of the sleep mechanism is common. Lethargy was a very prominent feature of the early epidemic, but its prominence has markedly decreased in recent years. Insomnia in a severe and persistent form was quite common in later epidemics. Insomnia by night and drowsiness by day is often encountered. Delirium, excitement, clouding of consciousness and disorientation are the mental signs most often met in the acute stage.

In considering the focal symptoms it must be borne in mind that the portion of the central nervous system least spared is the mid-brain, brain stem and the basal ganglia. The symptoms, therefore, are in the main directly related to these regions. The cerebral cortex, pyramidal system, spinal cord, and spinal roots are occasionally affected, but infrequently in relation to the upper mid-brain and basal ganglia. Ocular disturbances are the most constant and important of the focal symptoms, and are present in the great majority of cases. The subjective complaints of these symptoms are blurring of vision and diplopia. Inequality and irregularity of the pupils are common; in addition the reaction of the pupils to light and in accommodation may be absent. Papilledema and, rarely, choked disc may be present. Ptosis, usually slight, and either unilateral or bilateral, is quite frequently found. External ophthalmoplegia caused by impairment usually of the third or sixth cranial nerves is another important focal symptom. Conjugate ocular convergence is frequently impaired. Facial weakness, either of the upper or lower motor neuron type, and usually slight and transitory, is often found. Vertigo is sometimes encountered. Choreiform movements, myoclonus, hiccough and tremor have often been met with in the acute stages of the past, but are not so common at present. The reflexes are variable. Occasional signs of meningeal irritation, of stiff neck and positive Kernig are found. The spinal fluid may be negative. Moderate increase of lymphocytes, increased pressure, a luetic gold curve, and normal or increased sugar content, on the other hand, are common spinal fluid findings.

There is no doubt but that the virulence of the disease has diminished until now the cases we encounter are not so severe in their manifestations. For this reason it is often difficult to make a correct diagnosis. In the recent cases we have found the most prominent symptoms to be headache, blurred vision, insomnia or drowsiness, moderate fever usually of short duration, and occasional rise in cell count in the spinal fluid. The onset is often insidious. The usual seasonal incidence occurring during the winter months has disappeared, until now cases are more or less sporadic.

It is now recognized that epidemic encephalitis is usually a chronic disease. The so-called sequelæ consisting of the Parkinsonian syndrome, hypertonia, tics, blephorospasms, respiratory disturbances, etc., following the acute stage, are merely manifestations of the infection which has become chronic. These appear at variable times after the acute stage. In fact, we have frequently found patients having unmistakable signs of chronic encephalitis who did not remember having been sick, and did not know they had encephalitis. In some instances, the masked

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facies and beginning stiffness, with the peculiar flexed attitude, have been noted immediately after the acute stage. On the other hand these symptoms may not have made their appearance until four years, or longer, after the acute stage.

In considering the treatment of epidemic encephalitis, we are obliged to consider the treatment of two distinct classes of cases: (1) the acute cases; (2) the advanced cases, which exhibit the Parkinson syndrome or mental symptoms.

The treatment must necessarily vary in the consideration of these two groups, for in the first we are dealing with an acute infection accompanied by inflammation and exudation, while in the second group we are dealing with symptoms which exist, due to organic and degenerative lesions in the brain, as a result of acute infection and inflammation.

The acute cases.—The treatment of the acute cases is best managed by hospitalization, with exclusion of all visitors and members of the family, and allowing as complete mental rest as is possible. There should, of course, be skilled nursing care. Febrile symptoms and restlessness are controlled in the usual manner, with baths and the use of ordinary sedatives such as would be used in any acutely sick case. Spinal drainage is useful, particularly in cases where markedly increased spinal fluid pressure is observed. Drainage of the spine may be made daily or less often, as the individual case seems to warrant. Lumbar puncture is performed in the usual manner and the spinal fluid allowed to drain until the pressure is reduced to normal. The amount of fluid removed at each drainage is of no particular consequence, and varies in the individual case, as well as in different cases. The usual amount removed at a single drainage is from one-half to one and one-half ounces, depending upon the degree of increased pressure. One observation we have made is that in cases where the spinal fluid pressure is markedly increased, the prognosis is much brighter than in those cases where there is a normal or decreased pressure.

In the hemorrhagic type of case, spinal drainage may be made as often as twice in twenty-four hours to relieve intracranial pressure. The examination of the spinal fluid is always of value in determining the progress of the case, particular attention being paid to the rise or fall of the cell count in the fluid.

Specific medication, unfortunately, is lacking in the treatment of epidemic encephalitis. Assuming this disease to be caused by a bacterial virus, the logical route of attack is by means of intravenous therapy with virocidal remedies. To this end, various intravenous medications have been used, such as: sodium salicylate, mercurochrome, sodium iodide, neutral acriflavine.

The sodium salicylate treatment has been advocated chiefly by French clinicians, and as administered by them consists in daily intravenous injection of sodium salicylate in large doses. A solution of ten or fifteen per cent is used and the patient receives a daily injection, varying from two to five grams of sodium salicylate. We have never seen any particular benefit from this treatment. Venous thrombosis is particularly apt to occur following this administration of sodium salicylate, and no startlingly good effects have been observed. It is quite probable that just as much good would be accomplished with large doses of sodium salicylate given by mouth.

Intravenous use of mercurochrome we have tried very thoroughly, using a one per cent solution, and have found it to be of no value whatsoever.

Likewise, sodium iodide has proven inefficient in these acute cases. Of all the various forms of therapy, we subscribe solely to the use of neutral acriflavine, with which we have treated a large number of cases, with surprisingly beneficial results in a large percentage of those treated. Briefly, the technic for the use of acriflavine is as follows: The recrystallized and repurified salt is used, the commercial product being unfit for intravenous injection. The solution to be injected must be prepared freshly, each day, and must not be allowed to stand for any length of time in the light, because it is very unstable and breaks down readily. The solution prepared is one-half of one per cent in strength. Of this, 10 c.c. are injected intravenously every day for ten consecutive days. The injection must be made very slowly, taking about five minutes to inject the solution. If given too rapidly, there will be a marked respiratory reaction, which, while not at all dangerous, is a matter of great discomfort to the patient. During the injection there will be noted a flushing or mottling of the skin, lacrimation, and possibly sneezing or

vomiting. These symptoms are of no consequence whatsoever, and do not warrant interruption of the treatment. Great care must be used to have the needle in the vein, for extravenous infiltration of the tissues with the solution of acriflavine will always cause an acute local reaction and a sloughing of the tissues so infiltrated. After the first series of ten daily injections is completed, a period of rest for eight to ten days is given, and then a second series of injections is used in the same manner. A third series may be used after a second rest period, if it is deemed necessary.

In a large series of cases treated by the above described method, during the last four years, not a single adverse effect has been observed. Marked recession of clinical symptoms, both subjective and objective, has been observed in a large percentage of cases. In several cases this treatment has acted with almost the same specific effect as diphtheria antitoxin, causing a very rapid and complete recession of symptoms, with recovery of the patient. Marked reduction in spinal fluid cell counts has been observed. In one instance the spinal fluid cell count of approximately 500 lymphocytes was reduced to less than 200 lymphocytes after three injections. Improvement, if it occurs, usually begins after the third or fourth injection of this drug.

The advanced cases. — Unfortunately, the treatment of advanced cases of epidemic encephalitis, particularly those which exhibit the Parkinson syndrome, is still in the experimental stage. Nothing curative can be done for these patients. Various forms of treatment have been used, with varying degrees of success. The fact that these patients show symptoms which are indicative of organic and degenerative lesions in the brain makes a cure out of the question. Relief of symptoms is the most that can be hoped for. The management of this type of case includes, briefly, the following:

Removal of foci of infection, particularly in the teeth, sinuses and throat.

Careful regulation of elimination.

Proper regulation of diet, with attention to the general nutrition of the patient.

Physiotherapy, such as general massage, warm baths, and the use of diathermy.

Control of the life of the individual, to promote as far as possible emotional balance.

In addition to the above, various forms of medication have been used, with varying degrees of success. Stramonium is highly recommended in the form of powdered dry leaves. It is administered in capsule form, beginning with a dose of one grain three times a day, increasing the amount one grain a day until a maximum of fifteen grains a day is given. The dose is then decreased, gradually, until a dose of eight grains a day is reached, which is maintained for a week or ten days. A period of rest of a few days is then given and the procedure repeated.

In our experience, the greatest benefit has been given these patients by the use of tincture of belladonna, administered by mouth, for purposes of controlling sialorrhea. An initial dose of three drops three times a day is increased by one drop a day until the point of tolerance is reached, as shown by symptoms of belladonna poisoning. Patients often reach a maximum of thirty drops, three times a day, before having to discontinue this drug. In addition to this, intravenous acriflavine, as outlined above, and intravenous sodium iodide, 31 grains, three times a week until a point of saturation is reached, have proven useful. Hyoscin in small doses, administered daily, is of use in cases where there is a marked tremor. Unfortunately, little can be accomplished for the average case of this type, and while some temporary benefit may be obtained, lasting results are very disappointing.

The problem of post-encephalitic syndrome is one of the most formidable which confronts the profession today, and it is undoubtedly no nearer solution now than it was five years ago. Institutional care for these pitiful cases seems to be one solution of the problem, and some agitation has already been made for State Institutions to care for these sufferers.

THE SIGNIFICANCE OF TEMPORARY BLINDNESS*

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THE loss of any part of one's vision is an occasion for apprehension, and the cause of this loss becomes the object of intensive search. Partial loss of vision, or temporary total loss of vision, is not uncommon as a symptom of disease or disorder affecting the visual pathways, or of a constitutional disease or disorder. Temporary blindness, particularly, intrigues the physician. The absence of pathologic changes on examination of the eyes may be of as much importance as if definite changes were to be found in some portion of the eye, and it is well known that in some cases of temporary blindness the examination gives negative information.

If blindness occurs in the course of an illness, or following a surgical procedure, considerable apprehension may be aroused as to whether the loss of vision will be permanent. Indeed, permanent blindness may occur as a complication in rheumatic fever, Bright's disease, multiple sclerosis, tabes, meningitis, influenza, and in a number of less common acute, chronic, or recurrent diseases. From the effects of emboli following surgical operations in the pelvis, or on the extremities, temporary loss of vision occasionally is encountered, and even permanent blindness has been reported. Procedures apparently as harmless as aspiration of fluid from the pleura may bring on sudden loss of vision, to the consternation of the surgeon and to the dread and alarm of the patient and his friends.

Whether temporary blindness or permanent blindness is to be the lot of one in whom loss of vision occurs is often a matter of the extent to which the process directly responsible has gone. Many conditions which lead to temporary blindness lead also to permanent blindness. If changes in the media of the eye or atrophy of the nerve have been extensive, it can be definitely determined that vision never can be restored. Because of the difficulty in determining whether or not blindness will be only temporary, and because of the necessity for determining the cause early in the course of the affliction, thorough examination in cases of blindness becomes of great importance. For the proper examination of a patient who complains of temporary blindness, there is required a knowledge of the pathology of the eye and the visual pathways; but often it is necessary for the physician to match his wit against that of a malingerer or one who is actually deceived about his own vision. A carefully obtained anamnesis is the first step in the examination. Not only is it necessary to listen to the story of the patient but it is well to get this history independently from relatives or others who have observed him. Loss of vision, without adequate pathologic changes to account for it, is found in persons of nervous instability. The history may be of importance in arriving at a diagnosis.

FUNCTIONAL BLINDNESS

Hysterical amblyopia.—Case 1. A boy, aged eight years, in apparently good health, was the only child of a family that lived in a small Canadian village. He had an abnormally large head, but he had grown up among his playmates, and no mention was ever made of this condition in his hearing. He entered kindergarten and was making satisfactory progress when the parents moved to another part of town and the boy was placed in another school. A few weeks after he had been transferred to this school, he was sent home with a note from the teacher, saying that the boy complained of headaches, and considerable drowsiness, and that he was unable to see writing on the blackboard that was plainly visible to other children in the room.

A general examination failed to show cause for the boy's poor vision. An attempt was made to keep him in school, but the defect in vision increased until he was unable to get about alone. Physicians near his home, unable to understand any reason for his complaint, referred him to specialists in another city. The father was told that the boy had a tumor of the brain, and that in all probability he would never see again. It was because of this diagnosis that physicians at The Mayo Clinic were consulted.

Early in the course of the examination, and after a thorough search had failed to reveal any disorder or disease of the eyes, the father chanced to remark that in the neighborhood in which he first lived the children were very careful never to mention this boy's deformity, so that the boy himself apparently was unaware of any difference between himself and his playmates. After he had entered the new school, he was taunted by his schoolmates with the epithet "big-head," an insult which

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evidently hurt him and gave him a feeling of inferiority. The defense reaction of this child was to remove himself from the children who would hurt him and his chief defense took the form of hysterical blindness.

The boy was under observation for one week while he was at the clinic with his father and enjoyed the privilege of frequent visits to the zoölogical park and other places of interest. Complete vision was restored merely by a change of environment.

Comment.—Hysterical amblyopia, sometimes spoken of as retinal anesthesia, is functional blindness without pathologic change of the eyes or visual pathways. It is more common among women than men, and more common among young persons and children than older persons. It is not infrequent among girls in their teens who find some difficulty in adjusting themselves to disagreeable social circumstances or exaggerated parental solicitude. It is always bilateral, usually gradual in onset, and unassociated with headache, pain, or constitutional disease. The diagnosis is often suggested by the history, and is established by elimination of pathologic processes. It is confirmed by the restoration of good vision, by whatever effective means may be adopted. In some cases, I believe hysterical blindness becomes permanent.

It is essential, in the treatment of hysterical amblyopia, that one of two things be brought about: that the conditions under which the amblyopia developed should be changed, or that a situation be substituted which is more intolerable than the first. Most patients with hysterical amblyopia will recover their vision if kept in isolation, with their eyes bandaged and on a milk diet. In treatment of young persons, it is necessary that only such attention as is necessary be provided and that the company of parents or other visitors be not allowed. Two weeks of such isolation is usually sufficient to bring about restoration of vision. Recurrences among young persons are rare. Substitution neurosis may appear, but if steps are taken to correct the original cause of the disturbance, useful vision as a rule is maintained.

Amblyopia associated with migraine.—This type of functional neurosis is much more difficult to understand and far more difficult to treat. The blindness may take the form of scotoma, of hemianopsia, or even of complete blindness. The blindness usually precedes a severe migrainous headache, and may persist for hours or days after the headache has disappeared. Frequently, warning of the onset of blindness is given in the form of aura or floating spots before the eyes. Mild cases proceed no farther than scintillating scotoma or subjective sensations of flashes of light. In such cases not all attacks of migraine are associated with amblyopia, but severe attacks of headache, with some degree of blindness, may be frequent and often periodic. Although they are more common in persons about the age of fifteen to twenty-five, they may persist well beyond the age of fifty.

There must be other criteria, however, sufficient to establish the diagnosis of migraine, before one can assume that blindness associated with headache is not significant of organic disease. I have seen total permanent blindness of one eye that seemed to be due to repeated attacks of migraine.

BLINDNESS DUE TO PRIMARY DISEASES OF THE EYE

Glaucoma.—Temporary blindness is an early and frequent sign in simple glaucoma. Transient, high intraocular tension brings about definite reduction in vision through cloudiness of the cornea. The cloudiness clears away, with restoration of vision when the tension is reduced. As the glaucoma is usually limited to one eye, the blindness is also limited to one eye. I have had under observation a patient whose intraocular tension could be changed at the will of the physician from less than normal to more than five times normal, by the alternate instillation of homatropine and eserine. With each rise of tension, the vision would be reduced so that only perception of light remained. When the tension was reduced, vision came back to 6/5. The condition was limited to one eye. The glaucoma, however, could not be controlled indefinitely by miotics; so it became necessary to resort to operation to bring about permanently low tension. The more frequent attacks of hypertension from which the patient had suffered caused partial atrophy of the optic nerve, and partial permanent loss of vision in the eye resulted. It is possible for a person to have a marked increase of tension in both eyes at the same time, with marked reduction of vision. Careful examination of the eyes during the time when vision is poor will clearly reveal the diagnosis. Treatment instituted early in the course of the disease often

may save considerable vision which otherwise would be permanently lost.

Interstitial keratitis.—One of the most alarming inflammations of the eye, as well as one of those which gives a good prognosis, is interstitial keratitis, an inflammation of the cornea of children and young adults afflicted with hereditary syphilis. Although it is usually found in children between the ages of eight and sixteen years, it sometimes appears earlier in childhood. One eye is affected a few days to a few weeks in advance of the other, but both eyes are always affected, usually to the same extent. The second eye will become involved in spite of the most vigorous efforts to ward off its involvement. Hereditary syphilis often is not recognized until the onset of keratitis and frequently it becomes the duty of the oculist to investigate the family for other evidences of the disease, and to inform the parents of the seriousness of the malady. Delayed keratitis, occurring after the age of twenty-five years, may run the same general course as keratitis in younger persons, but appears to be more protracted. The end-result is the same. The acute stage lasts for six to ten weeks. During this time the patient is temporarily blind, with photophobia and lacrimation. During convalescence there is little, if any, pain, but light is poorly tolerated, necessitating the use of dark glasses until the cornea is clear. The prognosis as regards vision is good.

Keratitis associated with conjunctivitis is sometimes a complication of the exanthematous diseases, particularly measles, scarlet fever, and smallpox. Here the disease frequently takes the form of corneal ulcers which leave white scars in the cornea, a permanent obstruction to vision.

DISEASES OF THE OPTIC NERVE

Inflammation of the optic nerve is a common cause of temporary blindness, seen most often as a unilateral affection, and appearing as a complication in a large number of general conditions and a few local diseases. Optic neuritis is always accompanied by reduction in vision when it eye. Indeed, the cloudiness of vision may be the occurs in a previously healthy and functioning first symptom noticed by the patient. Although usually bilateral, it may be unilateral or alternating. It may be secondary to disease in the proximity of the optic nerve, although it is often metastatic from some chronic local or constitutional inflammation.

Syphilis.—Probably the most common cause of optic neuritis given in the literature and texts of twenty-five years ago was syphilis. Whatever the relationship was considered to be at that time, I am sure that it will not hold today. There are several reasons why we have to revise our ideas regarding the rôle of syphilis as one of the common causes of blindness, both as regards the optic nerve and the anterior segments of the eye. Let us not forget that in the last twenty-five years the Wassermann reaction has aided tremendously in determining the presence or the activity of syphilis, and that the diagnosis of syphilis in the face of repeatedly negative Wassermann reactions must be supported by a preponderance of positive evidence. Then, too, syphilis is recognized earlier and treated much more effectively than it was a few years ago. It is not uncommon, now, for the disease to be arrested before it reaches the secondary stage, and tertiary syphilis, except in forms of disturbances of the central nervous system, is rarely seen. Seldom is optic neuritis seen as a complication where large numbers of cases of primary and secondary syphilis are seen. It is asserted that the race is becoming immune to the disease and that it is noticeable in European as well as in American clinics that the severe secondary and tertiary lesions of syphilis, once so common, are conspicuously absent. Optic atrophy, or ocular tabes, still takes its toll in blindness, but there the loss of sight is permanent and not unexpected, for it occurs in about 10 per cent of the cases of syphilis of the central nervous system.

Retrobulbar neuritis.—The greatest controversy among oculists over optic neuritis rages about the causes of retrobulbar neuritis. This term should be applied only to those cases in which there has been a marked loss of vision, central scotoma, and retardation of pupillary reflex, without change in the optic disk or other obvious disorder of the globe or the media. The only symptom is loss of vision, of rapid onset unaccompanied by pain. Examination of the visual field will reveal a large central scotoma, loss of perception of color, and rise in the threshold of perception of light. In other words, there is a block along the conduction path of the retinal fibers, particularly in the macular bundle. It has been agreed that this block may be brought about (1) by pressure from an extraneural source, such as bulging sinuses, abscesses, tumors, or hemor-

rhages; (2) by local inflammation within the nerve or the nerve sheath through direct extension or possibly through metastasis, and (3) by toxins. If pressure from an extraneural mass can be demonstrated there is, in all probability, an answer to the question of the cause of the retrobulbar neuritis. The chief difficulty, however, has been to show conclusively that such pressure does exist in the absence of clearly demonstrable tumor and abscesses. Disease of the nasal accessory sinuses is held by a large group of outstanding oculists to be of such importance in retrobulbar neuritis that, regardless of rhinoscopic data and interpretation of roentgenograms, they will direct the opening of the paranasal sinuses by the rhinologist, and will assume all responsibility for the procedure, in the mistaken notion that ventilation and drainage of an apparently normal sinus is adequate to restore vision. A list of such cases can be supplied at will which on first consideration seem to support the argument that early surgical invasion of the sinuses is followed by restoration of vision in a few hours to a few days, and hence lends support to the theory that the retrobulbar neuritis in that case was due to disease of the sinuses. However, febrile treatment must be considered; foreign protein, without surgical invasion of the sinuses, has been used with equally good result. If it is necessary to ventilate and to drain the sinuses, how can the effect of protein therapy be explained? If equally good results are obtained, is it not better practice to use nonsurgical treatment and to avoid postoperative changes in the nose, that in themselves may give rise to discomfort and even disease?

It often has been demonstrated that a common cause of retrobulbar neuritis is multiple sclerosis, a disease of the nervous system that probably has no relation to any disease of the sinuses, although the rôle of focal infection in the production of multiple sclerosis is not clearly understood. Multiple sclerosis is a disease of young adults who often are apparently in good health. The symptoms, in mild cases, often are difficult to elicit and the disease may run for years before a satisfactory diagnosis can be made. In every case of retrobulbar neuritis in a young adult, multiple sclerosis should be thought of first, and in the absence of perfectly obvious causes of another nature, the treatment should be carried out along medical lines. Retrobulbar neuritis may be the only outstanding symptom of multiple sclerosis for years. I have recently seen, in a woman aged twenty-six years and in a man aged thirty-three years, the second attack of retrobulbar neuritis after ten years, with no ocular disturbance in the interim, and with gradually developing signs of multiple sclerosis during the last few years. In each case, vision was reduced barely to perception of light in one eye at the beginning of treatment and was restored to 6/6.

Almost complete blindness in one eye may be accompanied by partial blindness or hemianopsia in the other eye, a circumstance that may escape notice unless the visual fields of both eyes are carefully tested. Temporary blindness of one or both eyes, without change in the globe or disk, is most likely to be due to retrobulbar neuritis, but this diagnosis, once made, rarely should be used as an excuse or a reason for surgical invasion of the paranasal sinuses in the absence of visible pathologic change in the nose.

EMBOLISM, TOXEMIA, AND TOXICOSIS

It may seem rather incredible that sudden blindness should follow a simple procedure like thoracic puncture for pleural effusion; yet there are a number of authentic recorded cases. If an open cannula is employed in the puncture, air may be introduced into the veins, which, during a part of respiration, are under negative pressure. The general symptoms of air embolism, such as apprehension, fear of impending death, faintness, suffocation, and blindness, all come on suddenly, much to the consternation of the surgeon. The blindness is due to air in the arterioles of the retina, and the consequent ischemia. If only a small amount of air enters the vessels, the blindness may not be complete, and may clear away in a short while. I know of no case of total, permanent blindness from that cause.

Embolism of the retinal arteries is seen in cases of endocarditis and general vascular disease, including arteriosclerosis, more often, I think, in persons aged more than fifty years. Thrombosis of the retinal veins is probably seen as commonly as a result of arteriovenous compression or of disease of the wall of the vessel. There results infarction of the retina, with edema, hemorrhages, and exudates. A scotoma subtends the affected part of the fundus. If the central vessels of the optic nerve are occluded, permanent, total loss of vision results. In the toxe-

mia of pregnancy there sometimes occurs such edema of the retina that vision is reduced to the bare perception of light. The pathologic change is probably not limited to the retina, but involves the optic nerve in more or less severe optic neuritis, which may leave the patient totally blind if it persists for several weeks. In the active stages of retinitis, the choroid coat may be temporarily detached by serous exudate. I have seen two such cases with recovery of vision after elimination of the cause of the toxemia. Neuroretinitis, following miscarriage and subsequent uterine infection, may be followed by almost complete blindness, and constitutes one of the hazards of induced termination of pregnancy. Yet it sometimes becomes the duty of the oculist to decide, in a case of marked involvement of the eye in toxemia of pregnancy, whether vision can be restored without emptying the uterus. If pregnancy complicates multiple sclerosis, the issue is generally fatal. With the splendid prenatal care that most mothers now receive, the combination of toxic nephritis, high blood pressure, and albuminuric retinitis is less seldom seen. If the retinitis occurs late in the seventh month of pregnancy, expectant treatment may be adopted with a moderate degree of safety from permanent blindness, although every possible means should be adopted to combat the toxemia. In case of intractable hypertension, with albuminuria and retinitis, it is doubtful if many patients regain much of their vision if the condition has existed for more than six or eight weeks. Consideration of the termination of pregnancy is the only alternative to almost certain blindness in such cases, and must be undertaken, if at all, before irreparable injury has been done. In one patient under my observation the systolic blood pressure was lowered more than 100 points in twelve hours after the uterus had been emptied, and the retinitis began to clear away within a few days. Normal vision was restored after four months. It is the province of the general physician to determine the probable hazard of future pregnancies in women who have suffered retinitis with toxemia, but it is well known that women who have partial permanent blindness as a result of toxemia of pregnancy have gone through subsequent pregnancies without suffering the same complications.

If I were to mention all of the conditions which may be complicated with temporary blindness it would be merely to catalogue a number of them that are rarely encountered, or that are so well known that any further comment is uncalled for. Except in industrial centers, where factory workers are exposed to poisonous products, impure alcohol and tobacco probably head the list of poisons that produce blindness in varying degree. Quinine taken in large doses, as an ecbolic, will produce optic neuritis, with subsequent partial or total atrophy of the optic nerve. In ordinary doses, such as are given in the treatment of malaria for instance, it is a safe drug. The arsenicals, used in the treatment of syphilis of the central nervous system, particularly general paresis, have been suspected of producing optic atrophy. Further study of the effects of these drugs, however, would seem to indicate that only those patients who would have lost their vision through the disease had no treatment been given, have gone on to blindness. The drugs, administered in the same doses to persons free from disease of the central nervous system, have no effect on the eyes. It seems probable, therefore, that not the drugs, but the disease for which the drug is administered, must be held to account for blindness in cerebrospinal syphilis. The ocular conditions following injuries, diseases of childhood, septicemia, focal infections, constitutional diseases such as syphilis, tuberculosis, diabetes, anemia, toxemia from chemicals and drugs, hypertension, nephritis, tumor of the brain, and a host of otherwise insignificant disorders which may terminate in partial or complete temporary blindness, constitute an interesting chapter in the history of medical investigation and practice. Everyone who is engaged in the practice of medicine is concerned with the diagnostic signs revealed by the ophthalmoscope and the perimeter, and the well trained oculist is a most valuable consultant.

CIRCULATORY TESTS PREVIOUS TO AMPUTATION*

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THERE have been a number of tests recently developed to test the efficiency of the circulation in the extremities, but according to McKittrich and Root (1928), "At present no simple, practical, and accurate laboratory or clinical test is available by which the degree of circulatory disturbance in a given foot can be measured or by which the point at which amputation should be done is indicated. . . . Fortunately the patient usually gives sufficient clinical data to warrant an estimate of the circulatory condition of the foot sufficiently accurate for intelligent treatment."

Still some of these tests are of value in early diagnosis, in the differential diagnosis of these conditions, and also in giving corroborative evidence of the degree of circulatory disturbance. An attempt has been made in this paper to collect the various tests which have been proposed.

HISTORY

Frabricius Hildames (1560-1624) advised amputation at an early stage in gangrene and he advised that the incision should be made in the sound, and not in the decayed flesh.

Pott (1785) gives a good description of arteriosclerotic gangrene to which little could be added today. He states, "It frequently happens to persons advanced in life, but is by no means peculiar to old age. . . . It has by some been supposed to arise from an ossification of vessels, but for this opinion I never could find any foundation but mere conjecture." He advised allowing gangrenous toes to drop off of themselves.

Charcot (1856) called the fatigue and pain on exercise "claudication intermittente." Maurice Raynaud (1862) was the first to maintain that gangrene could occur without vascular occlusion. Billroth (1869) in speaking of arteriosclerotic gangrene said that we must amputate in the thigh as soon as the popliteal artery pulsation cannot be felt. Winiwarter (1879) used the terms "endarteritis" and "endophlebitis" in describing the condition of a man aged 57 with obliterative arterial disease of the extremities. From his description of the vessel pathology it is now evident that this was thromboangiitis obliterans. König (1887) first demonstrated that good results were obtained under careful aseptic operation in diabetic patients. Results were bad previous to the advent of aseptic surgery because the resistance of the tissues in the extremities was so low as a result of poor circulation. Marshall di Calvi was the first to call attention to the frequent relationship between diabetes and gangrene. Landlow (1892) described a large number of favorable results in senile and diabetic cases where a more distal amputation than through the thigh was done. Heidenhain (1891) so long as the gangrene involved the digits only, awaited a line of demarcation, but if it involved the foot he amputated every case above the condyles of the femur. In doing this he was influenced by the bad results he saw in lower amputations performed by Küster, but Küster also adopted a more proximal site for operation later. Buerger in 1908 established as a pathological entity the condition now often called Buerger's disease and called it obliterating thrombo-angiitis.

CLINICAL HISTORY

Some special features should be stressed in taking the history of these patients. What were the precipitating factors? Was it exposure to cold? Was it injury? Did it occur without any known precipitating cause? Is there abnormal fatigue in any part of the extremity? How much exertion is necessary to bring on this fatigue? Is there claudication? Is there rest pain? Have there been color changes, vasomotor disturbances, or phlebitis?

PHYSICAL EXAMINATION

Final opinion will be based largely upon physical findings. The following conditions should be looked for:

1. General appearance of the limb.
   a. Dry scaling atrophic skin.
   b. Irregularity of the nails.

*From the Department of Surgery of the University of Minnesota. Presented before the annual meeting of the Minnesota State Medical Association, Duluth, July 15, 1930.

2. Rubor or cyanosis when the limb is in the pendant position.

3. Ischemia on elevation of the limb.

4. The absence of some or all of the usual arterial pulsations. Single pulses eluded detection in less than 1 per cent of 700 ward cases examined by Erb's assistants. One case (0.5 per cent) in 200 supposedly normal individuals was found by Buerger where the dorsalis pedis artery could not be elicited. An apparently normal foot without pulse in the popliteal space or below the groin means a highly developed collateral circulation. It is uncommon and means that gangrene is impending.

5. The angle of circulatory efficiency should be determined. The extremity is raised to a vertical position and if it does not become ischemic the angle of circulatory efficiency is zero. This is the result one should obtain if the circulation is normal. If the foot becomes ischemic the limb is gradually lowered until it assumes the normal pink color. The angle of circulatory efficiency is that through which it has been lowered. The magnitude of the angle increases in direct proportion to the impairment of the circulation.

6. Search should be made for phlebitis. Recurrent phlebitis of the superficial veins is frequent in thrombo-angiitis obliterans.

7. The temperature of the skin should be roughly determined by feeling with the hand. In severe circulatory disturbance the skin of the distal portion of the extremity will be appreciably colder. Abrupt change is felt in sudden occlusion with poor collateral circulation.

8. Changes in the extremity following heat and cold should be noted. In Raynaud's disease the appearance and circulation is entirely normal between attacks but cold will precipitate the attack.

After this examination has been completed one should perform any of the special tests which are indicated. The tests regularly used in this clinic are the determination of the oscillometric index, the salt solution test of McClure and Aldrich, and the Moszkowicz test for spread of hyperemia after temporary interruption of the circulation. The surface temperature is determined with a thermocouple only in special cases, for example, in thrombo-angiitis obliterans where lumbar sympathectomy is contemplated. Other tests have not been used, or rarely used, but are described in an attempt to collect all the various tests which have been proposed to determine the efficiency of the circulation in senile or diabetic arteriosclerosis, or in thrombo-angiitis obliterans. These tests are listed not according to their importance but in chronological order of their development.

Palpation for pulsation to determine the site of amputation was mentioned by Billroth in 1869. Palpation of the pulse and the sphygmograph was employed by Gussenbauer, but he concluded that it was not reliable.

Moszkowicz described in 1907 the test now known by his name. It is based upon the fact that a hyperemia occurs after temporary interruption of the circulation. An Esmarch rubber bandage is applied beginning at the distal end of the extremity and wrapping in a proximal direction until the entire extremity is bandaged and compressed by this bandage to express practically all blood, both venous and arterial, from the limb. The bandage is then allowed to remain in place for five minutes or more, when it is removed in the distal to proximal direction. The area is ischemic immediately after removal of the bandage, but this is followed by a hyperemia appearing uniformly over the bandaged area in about a minute or less in the normal individual. In the patient with circulatory disturbance this hyperemia creeps down the extremity and appears in normal time in the proximal portion, where the circulation is adequate, but below this level it spreads more slowly and irregularly. The greater the impairment of the circulation, the more slow the spread of hyperemia. Adequate collateral circulation, if present, gives a normal reaction, regardless of the condition of the main artery.

The explanation of hyperemia is not clear. Paralysis of vaso-constriction has been suggested. Moszkowicz thinks it is excessive flow following damming back. From injection experiments, Moszkowicz concluded that the arterial occlusion should be at the site of the hyperemia or a few centimeters higher. These injection experiments consisted of intra-arterial injections of colored dyes above a ligation of the artery and he noted the area of skin colored by the dyes.

To amputate 5-10 cm. above the line of hyperemia is prudent. The skin flaps are best taken from the side where the hyperemia reaches lowest. By this test Moszkowicz says it is possible to determine, in some cases, where only the toes are gangrenous, that it is safe to await the dropping off of the toe or to amputate the toes or to amputate at the root of the foot. The test is influenced by severe infections.

Wieting (1908) left both limbs bare for fifteen minutes, then covered them with bed clothes

for fifteen minutes and amputated at the level of warm skin in the diseased limb.

Delbet (1909) emphasized the fact that absence of the peripheral pulse from any cause without affecting the nutrition or vitality of the extremity means the collateral circulation is fully established. This is particularly applicable to aneurism, tumors, etc.

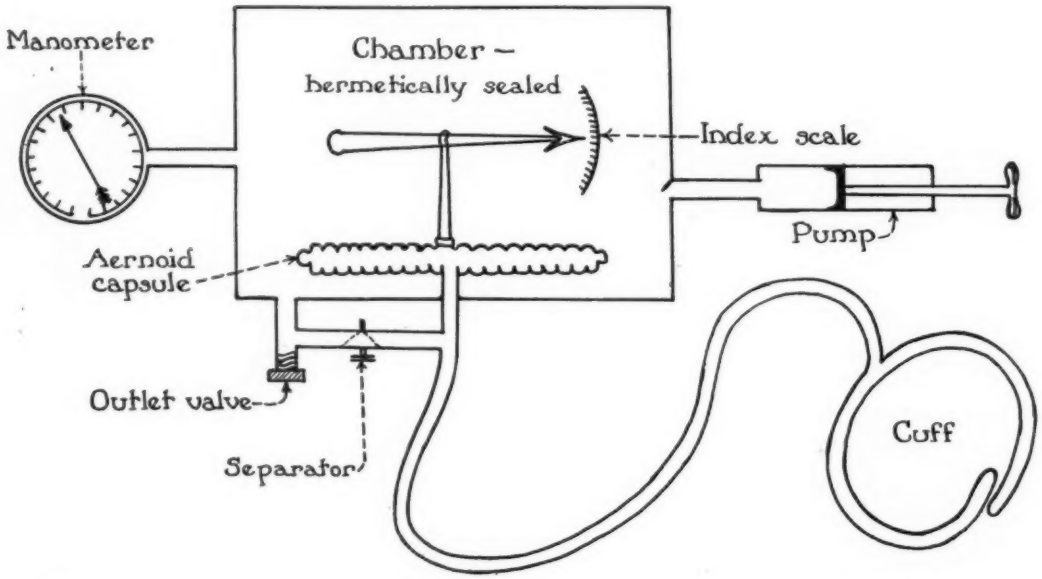

Fig. 1. Diagram of Pachon oscillometer from *Comp. rend. des sc. et mem, de la soc. de biol.*, 1909, Vol. 66.

Pachon oscillometer test (1909): In order that a capsule be constant and of maximum sensibility it is necessary that the capsule shall be without tension. The Pachon oscillometer is so constructed that there is an aëronoid capsule within an outer chamber, the capsule so arranged that the chamber and capsule are in communication and therefore under equal pressure but can be disconnected by a separator while a reading is taken. The reading is called the oscillometric index and is the number of points on the scale over which the needle passes in its excursion. To eliminate false movements due to muscular contraction the patient must be reclining and relaxed. All readings should be made at a uniform pressure for each case. They are best taken at the diastolic blood pressure. Maximum oscillations of the needle are obtained at this pressure. Toward the periphery of the extremities there is a normal decrease of the index. Normal readings as given by Samuels (1927) follow:

Upper arm	4-20
Elbow	2-12
Wrist	1-10
Palm	0- 2
Thigh	4-16
Upper third of leg	3-12
Ankle	1-10
Pedal circulation	0.5- 2

Observations by McKittrich and Root on the circulation of the legs of eighteen diabetics are given in Table No. 1.

The amplitude of oscillation theoretically reflects the amplitude of the pulse. Its change should indicate the level of occlusion in the artery.

A marked increase in the oscillometric index in cases of vasomotor spasm was observed by Babinski and Heitz (1916) after immersion of the limb in a warm bath for a period of ten minutes, but this change was not evident in true occlusive lesions. A marked increase in the oscillometric index in cases of vasomotor spasm was also observed by Oelentz and Cornil (1919) after the application of an Esmarch bandage for five

minutes, but it did not occur in organic vascular occlusion.

Physical limitations in the instrument, according to Samuels, are (1) inability to select any one vessel for study and (2) insensibility to that state of the circulation represented as lying between zero and total cessation of flow.

$$Q = \frac{H}{T - T_1} \cdot \frac{1}{S}$$

Q = Blood in grams
H = Heat given off
T = Temperature of arterial blood
T_1 = Temperature of venous blood
S = Specific heat of blood

The heat loss from the surface of the extrem-

TABLE No. 1.

No. of Cases	Average Oscillation				Pulsation in Dorsalis Pedis Artery		Clinical Symptoms			
	Right Leg		Left Leg							
	Above Knee	Below Knee	Above Knee	Below Knee	Present	Absent	Gangrenous	Intermittent Claudication	Ulcers	Cold Feet
Oscillations diminished										
14	3.0	0.5	3.0	0.0	5	9	5	3	3	14
Normal										
4	6.5	4.0	5.0	4.0	4	0	0	0	0	4

No information regarding the extent of the collateral circulation is given by the oscillometer, therefore, one may have a living foot with a zero reading. The force and character of the cardiac contractions affect the oscillations. After following with the oscillometer for the purpose of determining the prognosis the course of 124 cases of thrombo-angiitis obliterans for periods varying from three months to four and one-half years, Silbert and Samuels (1928) concluded that when the oscillometer shows pulsation at the ankle the prognosis is good, even if ulceration or gangrene is present.

Particularly useful to determine safety of ligation of a vessel is the Tuffier and Hallion test (1912). For this test, to obstruct venous return of blood causing turgescence an elastic circular band is applied. Collateral circulation is established if this turgescence recurs after compression of the artery or arteries of the extremity. This test is not applicable where there is swelling.

Stewart (1913) described the heat elimination test. Heat produced in an extremity is negligible in comparison with that conveyed to it by the circulation. The temperature of the incoming blood is known and that of the outgoing blood is taken to be the temperature of the skin. The amount of heat given off in a known time is measured. The "volume per minute flow" can then be computed with the following formula: ity for a given period of time was measured by Brown, Allen and Mahorner (1928) with the Stewart calorimeter as modified by Kegerreis. The loss of small calories per minute per square inch was calculated. To interpret this in terms of volume flow of blood is not possible because there are too many unknown factors to attempt a quantitative estimation of this relationship, but it is not essential. The relationship between blood flow and heat loss, however, is very close. At room temperature of 22 to 28° C. normal persons lost per minute 0.46 to 1.15 calories per square inch of body surface. In patients with thrombo-angiitis obliterans the rate of heat loss varied from 0.27 to 1.13 calories per minute for each square inch of body surface.

With a thermocouple applied to the skin Brown, Allen and Mahorner (1928) measured surface temperature at a room temperature which varied from 22 to 26° C. From the trunk to the distal areas of the hands and feet the temperature decreases. The normal temperature of the foot was found to vary between 24 and 35° C. In patients with thrombo-angiitis obliterans the temperatures were approximately the same. That skin or surface temperature per se is not, therefore, a good indication of arterial insufficiency is apparent, since the findings in both the normal and pathologic subject may be the same.

But in the skin temperature increase of the affected limbs, after administration of a foreign protein to produce vaso-dilatation, lies the essential difference. The surface temperature variations following increases in body temperature as a result of foreign protein injection give information regarding the extent of vaso-dilatation and can be employed in place of the more time consuming method of the study of the rate of heat elimination. To perform this test the body temperature and the surface temperature are determined. Foreign protein in the form of typhoid inoculation sufficient to give chills and fever (80,000,000 to 100,000,000 bacteria) is injected intravenously and changes in body temperature and surface temperature are followed. The amount of vaso-dilatation that can be produced in the collateral circulation is determined by this method.

The increase in surface temperature is 3–10° C. in normal individuals. The vasomotor index is $V_1 = \frac{ST-BT}{BT}$, where ST is the increase in surface temperature, expressed in degrees Centigrade, BT is the increase in systemic temperature, expressed in degrees Centigrade. $V_1 =$ 1—10 in subjects without arterial occlusion, according to these investigators; in subjects with thrombo-angiitis obliterans it was $V_1 = 0$—6.5. Lumbar sympathectomy is not advised according to Adson and Rowntree unless V_1 is greater than 2.

A subcutaneous thermocouple was inserted (usually into the great toe) 6 mm. under the skin surface by Brooks and Jostes (1924). The temperature is determined, then a tourniquet is applied for 10 minutes. The original temperature varies widely in normal subjects but there is a uniform fall in temperature with the application of the tourniquet followed by an immediate and rapid rise after its removal. In subjects with known arterial obstruction the temperature fell during the period the tourniquet was on and following its removal the rise was delayed, the temperature continuing to fall for from two to seven minutes after removal of the tourniquet and in most cases the rise was less rapid.

The salt solution test of McClure and Aldrich (1923): From the base of the great toe up the leg at four inch intervals 0.2 c.c. of 0.8 per cent aqueous solution of sodium chloride is injected intracutaneously. Isotonic salt solution is used because it is less painful than water. This test was first used by McClure and Aldrich in normal children and those with edema of nephritis. In those with edema the time of absorption was shortened and the onset of edema could be predicted by earlier absorption. Disappearance of edema for a few days before its actual disappearance could be predicted by slower absorption. After having read the publications of McClure and Aldrich, Cohen used the test in 1925 to determine the adequacy of the arterial circulation in the extremities in cases of arterial disease associated with pain, vasomotor disturbances and even gangrene. He stresses the value of the test in giving evidence of oxygenation and nutrition of the tissues, *i.e.*, he thinks it estimates these conditions more accurately than does volume of blood flow. He demonstrated that the wheals disappear earlier immediately after ligating the single vessels of the thigh but very much more rapidly if the entire thigh had been constricted for one hour. Experience with this test in 97 cases was reported by Stern and Cohen (1926). The normal time for disappearance of the wheals was found to be approximately 60 minutes. But readings as low as 30 minutes at the base of the toe have been considered as normal. In cases with edema the test is not to be relied upon because edema regardless of the condition of the circulation causes a reduction in the absorption time. These investigators check their findings with the oscillometer.

Intra-arterial injection of sodium iodide solution was reported by Brooks (1924). He dissolved 100 grams of sodium iodide crystals in 100 c.c. of distilled water. It was sterilized and injected into the femoral artery, which had been exposed by arteriotomy. The venous flow was obstructed by a tourniquet at the thigh. Distal to a clamp on the artery a needle was inserted into the artery and 10 c.c. of sodium iodide solution injected. An *x*-ray film was made of the extremity. Because the patients had severe pain while the arteries were filled with the solution a general anesthetic was given. The pain was relieved as soon as the obstruction to the circulation was removed.

The compression test described by Allen (1929) consists of manual compression of either the ulnar or radial artery to demonstrate

occlusion of the other. With the artery compressed the patient closes his fist firmly. Pallor results after the grip is relaxed. With the artery still compressed this pallor remains if there is occlusion of the other vessel; hyperemia quickly displaces the pallor if the other artery is normal. This hyperemia gradually fades to the normal color.

DISCUSSION

Good clinical judgment must be relied upon in the final analysis. The Moszkowicz test, the skin edema test of McClure and Aldrich, and the oscillometric index may be easily determined with a minimum risk to the patient and should therefore be employed. There is some slight danger of thrombosis in the Moszkowicz test and of infection in the salt absorption test. McKittrich and Root have not found the oscillometer of great practical value except as an aid in the early diagnosis of arterial occusion. Palpation of the arteries and careful consideration of the symptoms alone is sufficient in 90 to 95 per cent of the cases according to Brown, Allen and Mahorner.

SUMMARY

1. The tests which have been proposed to test the efficiency of the circulation in arteriosclerosis, senile or diabetic, and in thrombo-angiitis obliterans are collected and briefly described.

2. The oscillometric index can be taken and the skin edema and Moszkowicz tests can be most easily performed with a minimum risk to the patient. The information obtained is of value when used to supplement the history and physical findings.

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RECURRENT LYMPHANGITIS*

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THE term, "recurrent lymphangitis," as used in this paper covers all the pathologic conditions that are known under the names, "recurrent erysipelas," "erysipeloid," "lymphedema," "elephantoid fever," and "solid edema." These terms often are used loosely. In the stricter sense, the term erysipeloid probably should be applied to and restricted to the type of erysipelas which is seen in persons who are brought into contact with hogs and other domestic animals, and which is due to the *Bacillus murisepticus*. The term, lymphedema, should be restricted to stasis of lymph as the result of mechanical obstruction; for instance, the obstruction following radical amputation of the breast without infection. The term, solid edema, is better restricted to the end process of recurrent lymphangitis in certain situations. The preceding lymphangitis may have been a process of very low grade in such cases. But in this country, the various terms are often used interchangeably, and I shall, therefore, include them in the term, recurrent lymphangitis.

Recurrent lymphangitis varies markedly in severity; it may be very mild or very severe, with all gradations between. In a typical acute attack, circumscribed areas of skin become hot, red, and swollen. The inflammation is superficial and always recurs in about the same area. The individual attack resembles closely the early stage of erysipelas, and pathologically it is erysipelas, but it differs biologically in that the areas involved are limited and that the attack lasts only a few days. Possibly the background is the development of an allergic state. The local involvement of the superficial lymphatic channels is associated with chills, often a high fever, and malaise. The satellite lymph nodes are practically always enlarged and tender. All these symptoms and signs may be minimal, and some of them may be overlooked if they are not searched for. Gradually the recurrent attacks, even those of the mildest type, lead to fibrosis with considerable thickening of the tissues, and moderate or even pronounced elephantiasis results. It should be borne in mind that very mild attacks of recurrent lymphangitis may lead to a considerable degree of elephantiasis. As time goes on the inflammatory reactions often become less pronounced, but the fibrotic changes, the stasis of lymph, and, therefore, the permanent enlargement and thickening of the involved areas increase. The end stage is permanent and occasionally leads to a grotesque appearance, or even to marked disability. The lids may become so thickened that the patient is practically unable to use his eyes; the upper lip may assume a truncated appearance; the penis may become buried in the folds of an elephentiasic enlargement of the scrotum, and the arms and legs may become so heavy that they are practically useless.

Recurrent lymphangitis is most commonly seen in the lower parts of the legs, the forearms, the eyelids, the nose, the upper lip, the prepuce and the scrotum. It is as yet a matter of surmise why it should have preference for certain anatomic regions, but clinical observation would indicate that these regions represent channels of drainage for atria that are likely to harbor infection. The nose and upper lip probably are infected by way of the nasal and paranasal sinuses and the teeth; the eyelids, through the lachrimal sac; the forearms, secondarily to trauma of the hands, and the lower parts of the legs, because of fissures between the toes, as the result of intertrigo, and particularly as the result of the universal infection with the epidermophyton. It is likely that the scrotal involvement is commonly due to scratching. On other parts of the body, I have seen the condition following vaccination on the upper part of the arm, and following old osteomyelitis of the thumb. Clinically, recurrent lymphangitis, with its subsequent changes in tissue, is sometimes distinguished with difficulty from certain forms of sarcoid, lupus erythematosus, phlebitis, and even a sclerosing syphilide. This difficulty, however, is usually obviated by a histologic examination and by

*From the Section on Dermatology and Syphilology, The Mayo Clinic, Rochester, Minnesota. Read before the Minnesota State Medical Association, Duluth, July 14 to 16, 1930.

observing the clinical behavior for a period of time. The histopathologic changes are essentially those of erysipelas, as would be expected because the process is the result of invasion of the superficial lymphatic channels by the streptococcus, and possibly occasionally by the staphylococcus. There is dilatation of the lymphatic channels associated with stasis of lymph, and pronounced infiltration with polymorphonuclear leukocytes. Later, plasma cells assemble, and definite fibrosis sets in. The seat of the plasmoma is primarily in the lymphatic channels, enclosed in the collagenous substance; the latter gradually becomes hypertrophic. This process eventually leads to the advanced changes of confirmed elephantiasis nostras.

The treatment of recurrent lymphangitis in its earlier stages is a different matter from that in the later stages, when much fibrosis has taken place. The permanent fibrotic changes probably can be removed effectually only by surgical measures, but the recurrent attacks of lymphangitis may pass through many years before any pronounced deformity has occurred. It is during the early years of inflammatory activity that the patient should have treatment to avoid permanent deformity, but it would seem that this stage is very puzzling and that the patient usually has not received any benefit from the measures employed. Fortunately, nature occasionally limits the process by the ensuing fibrosis but usually not until considerable injury to tissue has resulted. It is in the earlier stages that I have seen such gratifying results in a limited number of cases (seventeen) from the use of foreign protein given intravenously, and filtered roentgen-rays applied locally, that I am stimulated to dwell somewhat on the details of the use of these measures.

I have always given the foreign protein in the form of mixed typhoid and paratyphoid vaccine. The dosage has varied from 5,000,000 to 3,000,000,000 typhoid bacilli given at intervals of from one day to a week, and the number of doses from ten to twenty to a course. In several cases, two or three courses were given, each after an interval of several months. The variations in dosage, and so forth, were dependent on the reactivity of the patient, the severity of the process and the patient's response to treatment. Here, as in all forms of treatment, clinical judgment is necessary. The dosage of roentgen rays, of course, had to vary with the area involved and with the type of involvement. It may be recalled that the process affects chiefly the superficial lymphatic structures. This fact ought to enable any expert radiologist to give the proper dosage. Roentgenologic treatment, in this disease, as in others, should be given only by the expert. Therefore, I shall not need to dwell on the factors employed. It has been, and is, my impression that of the two methods of treatment, injection of foreign protein is the more valuable, but that is difficult to decide, for I usually combined the two. I have observed three patients who, I think, did well on foreign protein alone. I do not recall nor do the records reveal any case in which good results followed treatment by roentgen rays alone.

It is not always possible to find the atrium of infection at the time the patient presents himself for treatment of the lymphangitis. However, if it can be found, I am assuming that, in the treatment of recurrent lymphangitis, an effort should always be made to bring about healing of any atrium through which infection might gain entrance to the lymphatic structures. Lesions of epidermophyton of the feet, infected antrums and so forth, should be treated simultaneously with the lymphangitis.

CASE REPORTS

LEG LENGTHENING FOR SHORTENING DUE TO INFANTILE PARALYSIS*

WALLACE H. COLE, M.D.
Saint Paul

Leg lengthening for the shortening due to infantile paralysis was first attempted by Dr. Leroy Abbott, and his reports discuss fully the indications for such a procedure, in addition to showing the feasibility of the operation. Several workers since that time have devised apparatus for accomplishing the lengthening and Abbott himself has several times modified his machine. It is not the purpose of this brief communication to review what is already in the literature or to report a series of cases but merely to again call to your attention the fact that legs can be lengthened and to show the slides of some of the cases treated at the Shriners' Hospital, where satisfactory results have been obtained in paralytic shortenings by an apparatus devised and made at that institution in 1927 and used since that time. The usefulness of the operation is, of course, not confined to paralytic cases only, and shortenings due to congenital defects, injury, tuberculous hips, etc., also can be lessened or completely overcome.

The procedure is a severe one and should not be lightly undertaken, but with proper care there seems to be no reason why children with a marked difference in the length of the legs should not be given the benefit of the operation. The cases shown here all belong to the group where only the leg below the knee has been lengthened, although the thigh can also be elongated by a similar undertaking and with a modification of the apparatus. A lengthening up to 6 or 7 cm. can usually be obtained in the leg proper and this suffices in most cases. The age of the patient, within reason, does not seem to make much difference, as a given increase in length probably means just as much late in life as earlier and 5 cm. gained when 9 years of age is still 5 cm. when adult life is reached. The effect of the operation upon the growth of the bone is not yet known, of course.

The operation, which is performed under a tourniquet, consists briefly of the following steps: (1) tenotomy of the tendo achillis even if this structure is not tight; (2) transverse osteotomy of the fibula in its lower third and sometimes also in its upper third, being sure the periosteum is completely severed; (3) insertion of one modified Steinman pin in the lower end of the tibia and of two pins in the upper end, the three being in the same plane; (4) osteotomy of the tibia into proximal and distal fragments by long longitudinal cuts and two transverse cuts so that the fragments can slide on each other; (5) cutting of all tight fascial and periosteal bands possible; (6) application of the apparatus after closure and dressing of wounds.

The leg is kept at rest for eight to ten days to allow the skin wound to heal and then traction is applied to the distal pin, the two proximal pins being fixed by the apparatus. As a rule the required length can be obtained in about four weeks and when this is accomplished no further traction is attempted. Usually the

*Read as a case report at the meeting of the Minnesota Academy of Medicine, September 17, 1930.

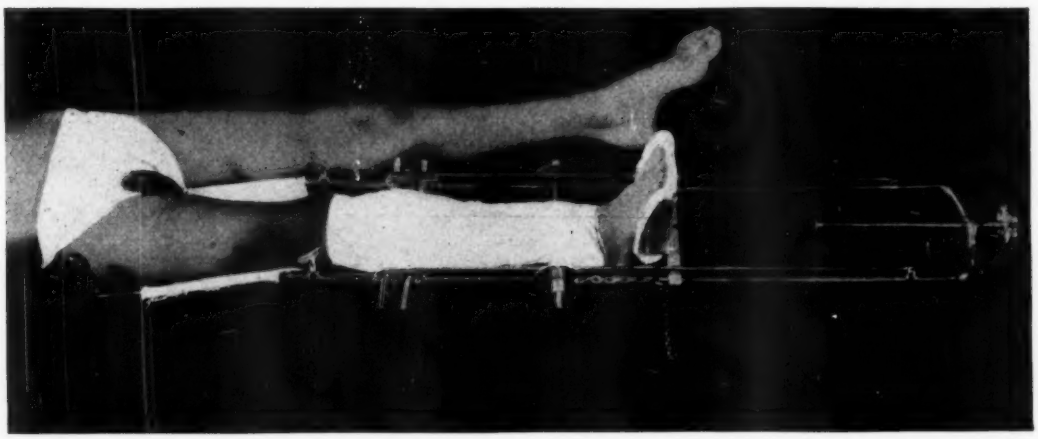

Fig. 1. Leg lengthening apparatus in use. Note the two pins in the upper fragment and one pin in the lower. The footpiece keeps the foot at a right angle, with the pull transmitted through the chains on either side to the distal pin. The centimeter scale is seen as a serrated bar. This shows in the radiographs and gives an exact reading of the lengthening obtained.

Fig. 2. *A*. Patient (No. 512) on June 22, 1927. *B*. Same patient on March 25, 1929, showing results of leg lengthening during the summer of 1927 and subastragalar arthrodesis.

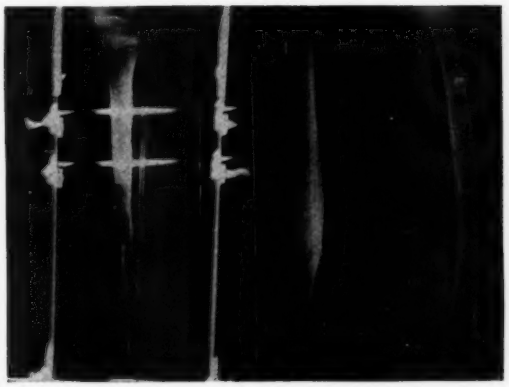

Fig. 3. *A*. Radiograph of above patient (No. 512) on August 9, 1927. *B*. Radiograph of same patient on January 3, 1930.

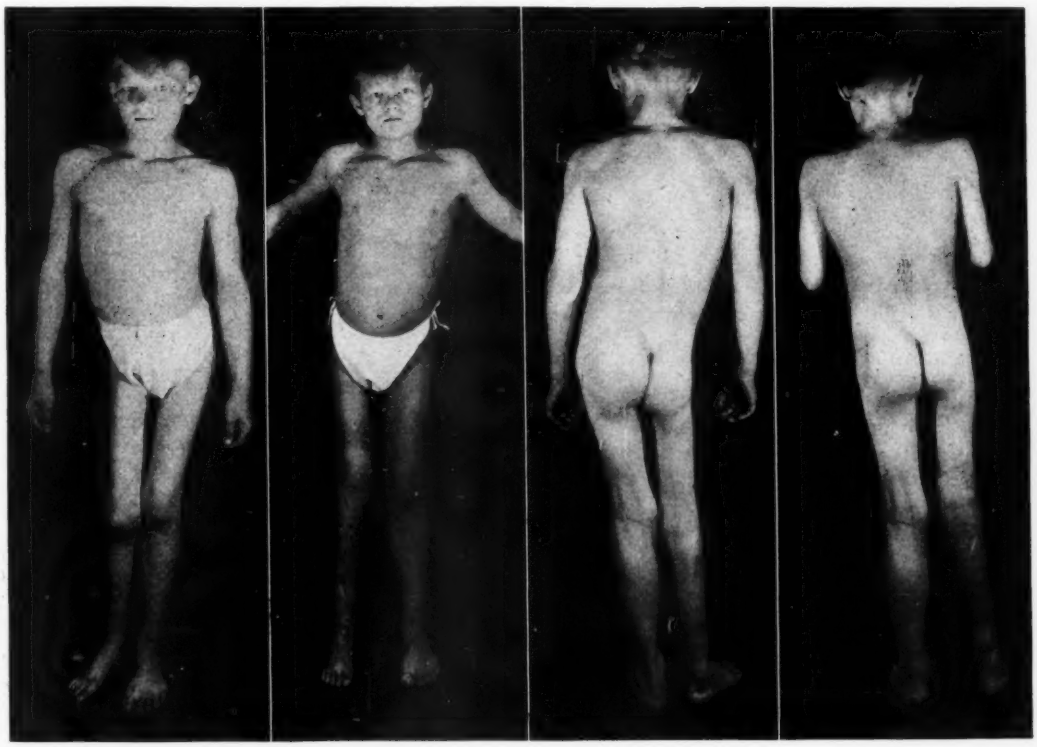

Fig. 4. *A*. Patient (No. 139) on June 26, 1928. *B*. Same patient on December 5, 1928, after leg lengthening. *C* and *D*. Same patient (No. 139), seen from behind.

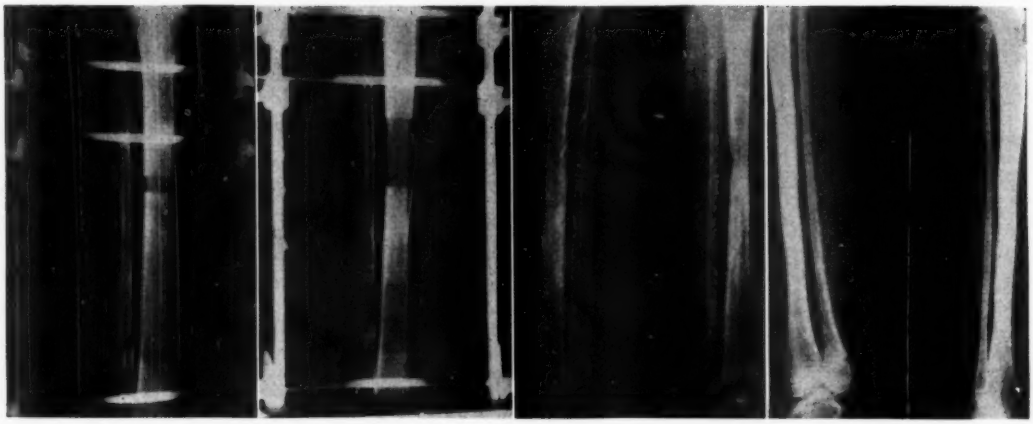

Fig. 5. *A.* Radiograph of patient (No. 139) shown in Figure 4 on August 13, 1928. *B.* Same on September 8, 1928. *C.* Same on November 29, 1928. *D.* Same on June 10, 1930.

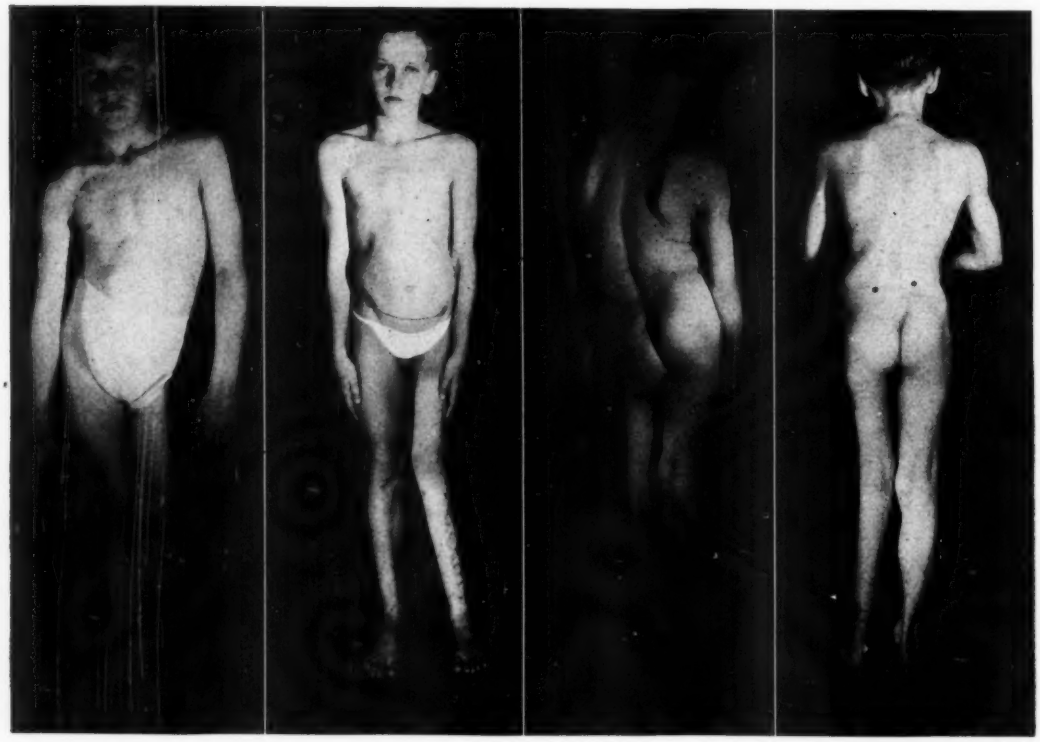

Fig. 6. *A.* Patient (No. 633) on June 5, 1929. *B.* Same patient on October 11, 1929, after leg lengthening. *C.* and *D.* Same patient (No. 633), seen from behind.

leg can be put into plaster shortly after this and supported until union is firm. A ring caliper splint will allow the patient to be up and about much sooner than otherwise.

The illustrations show the method better than any written description. (Only enough of the illustrations are here reproduced to show the character of the procedure and the end-results.)

Fig. 7. Radiograph of patient shown in Figure 6 (No. 633) taken on April 22, 1930, the leg lengthening operation having been in June, 1929.

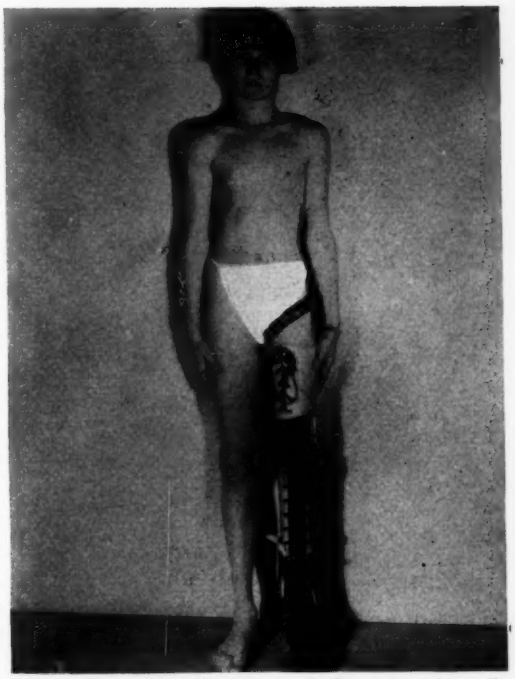

Fig. 9. Same patient (No. 981) seen in Figure 8 wearing walking caliper to protect lengthened leg. Taken on May 24, 1930.

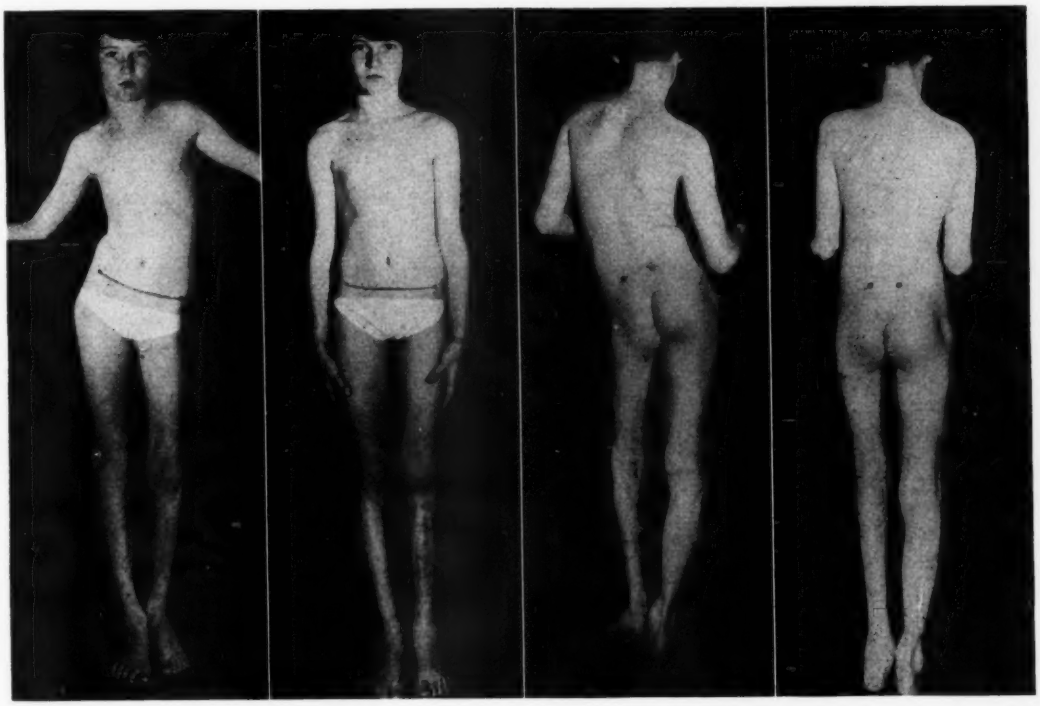

Fig. 8. *A*. Patient (No. 981) on December 5, 1929. *B*. Same patient on May 24, 1930, after leg lengthening. *C* and *D*. Same patient (No. 981) seen from behind.

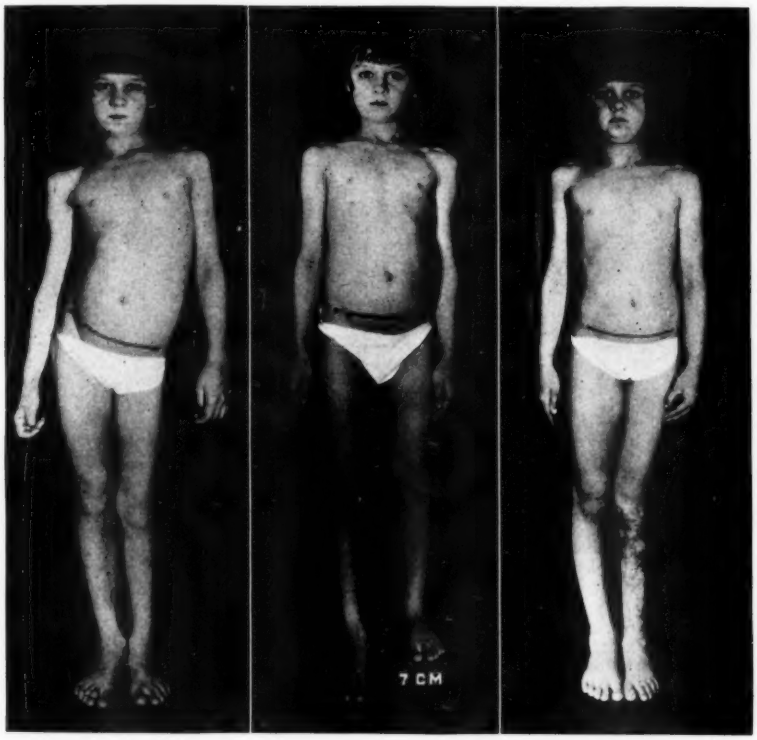

Fig. 10. *A.* Patient (No. 715) on January 7, 1930. *B.* Same patient with a 7 centimeter block under left foot to show correction of pelvic tilt. *C.* Same patient on May 24, 1930, after leg lengthening.

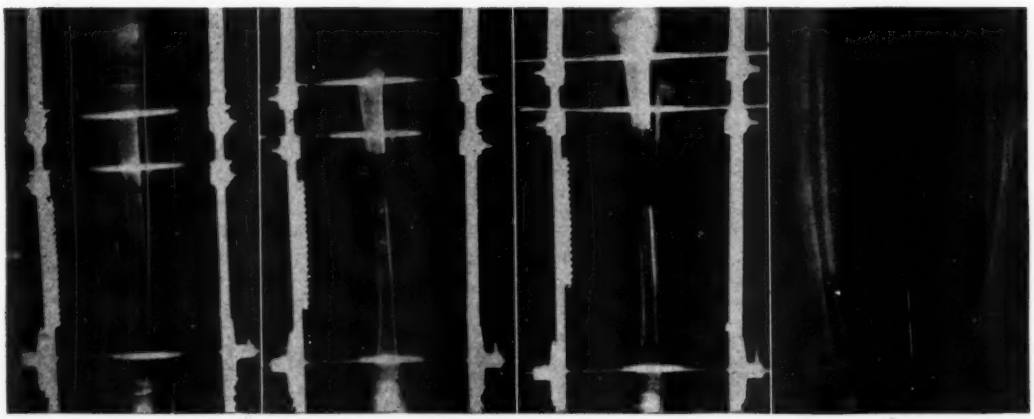

Fig. 12. *A.* Radiograph of patient shown in Figures 10 and 11 (No. 715) on January 20, 1930. *B.* Same on February 10, 1930. *C.* Same on March 2, 1930. *D.* Same on May 23, 1930.

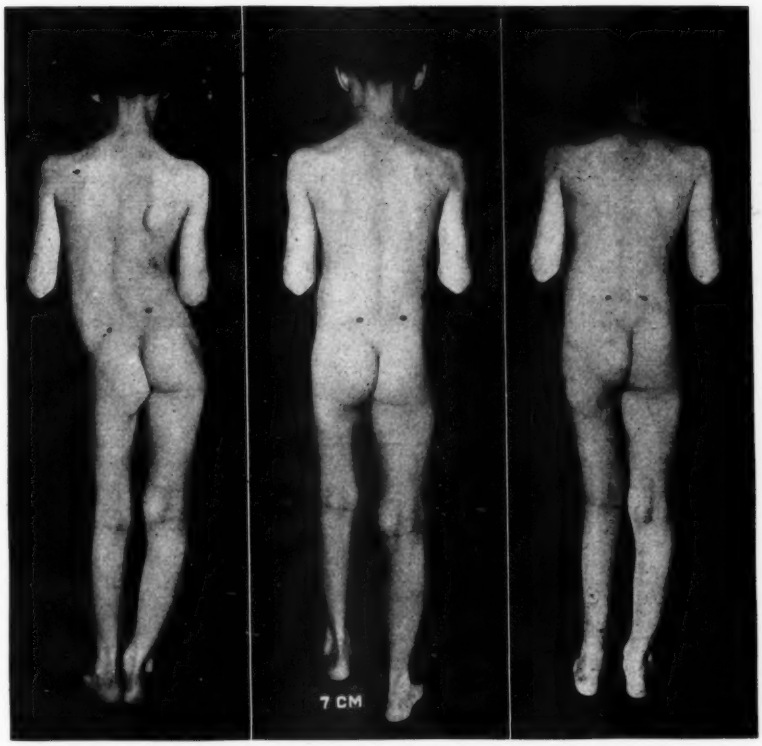

Fig. 11. Patient shown in Figure 10 (No. 715) but seen from behind. *A*, *B* and *C* correspond to the same letters as in Figure 10.

INTESTINAL FOREIGN BODIES

REPORT OF FOUR CASES OF REMOVAL BY APPENDECTOMY OR BODY POSTURE CHANGE

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St. Cloud, Minnesota

Reports of removal of swallowed foreign bodies have appeared at intervals in the literature. Four cases are herewith added to a list of ten cases reported by various authors. These foreign bodies include glass, nails, wood splinters, paper clips, hair bristle, and tablespoons. They have been swallowed accidentally in some instances, or by insane persons or professional nail and glass eaters. The majority of swallowed bodies are eliminated by the natural passages. When retained, these bodies are usually found in the stomach, the duodenum, the ileum, the cecum, or a diverticulum. Examples of various locations of foreign-body retention are given in the accompanying table. Various surgical procedures were required for the removal of the bodies from the patients listed in the tabulation.

The present report concerns the personal observation of four patients who accidentally swallowed foreign bodies and retained them in the cecum. One was removed by appendectomy and the others by changes in body posture. *Case 1.*—A. L., a male, aged 19, reported that for two or three days he had suffered pain in his right side and that two weeks before, while at work, he had accidentally swallowed a nail and wondered if that could be cause of his pain. The temperature, pulse, urine, and leukocyte count were normal and radioscopy revealed a shadow resembling a flat-headed nail in the region of the cecum. Continued observation revealed, forty-eight hours later, some rigidity of the right rectus abdominis muscle and a leukocytosis of 11,200 with tenderness over the cecum. Laparotomy was then performed. A low right rectus muscle incision was made under nitrous oxide-oxygen anesthesia at 8 a. m. April 6, 1930. The cecum was pulled up at a point where radioscopy indicated the nail shadow. An area of hemorrhagic discoloration was present on the outer side of the cecum and about four or five inches above the ileocecal valve. The nail could be palpated at this site and its point was demonstrated, by manipulation, to be fixed in the wall of the cecum. The sharp end of the nail was backed out and moved with the aid of Lockwood forceps, head first, down the bowel lumen to the appendix vermiformis, into which it was "milked" point forward. Appendectomy was then performed and the nail with the appendix was removed. The accompanying illustration shows the nail as found in a fold of mucosa of the cecum at "A" and also as moved into the appendix vermiformis at "B" ready for re-

moval by appendectomy. Recovery was uneventful and the patient left the hospital April 17, eleven days after operation. The pathologist's report follows: "Specimen of appendix vermiformis, 0.9 by 7 cm. Serosa has tags of fibrous tissues attached, otherwise is without evidence of inflammatory change. A steel nail is present

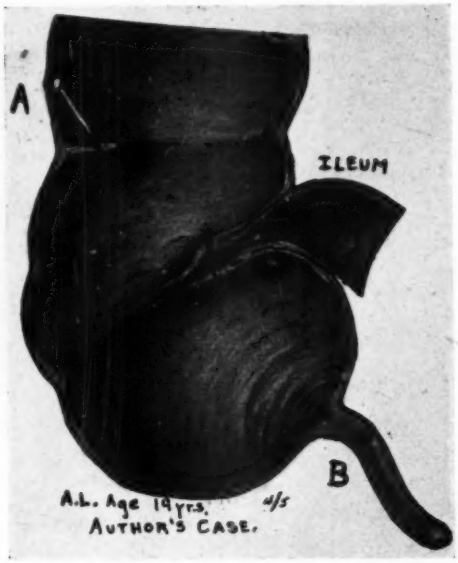

Fig. 1. Drawing shows the nail partially perforating the bowel wall at *A* and also in the lumen of the appendix vermiformis at *B* into which it was "milked" for removal by appendectomy.

in the lumen. Its surface is black but smooth. The nail is 3.5 cm. long, about 2 mm. in diameter and the head is 5 mm. in diameter.

Cases 2, 3, and 4.—These three boys (J. B., aged 12; A. S., aged 6, and T. F., aged 7) though seen months apart, had accidentally swallowed a steel ball from an automobile bearing, which had been used in playing marbles. All steel balls were about one-half inch in diameter. In each patient the steel ball remained in the caput coli and removal was accomplished without surgery. After thoroughly emptying the large bowel, the patient was placed upon the radioscopic table in the Trendelenburg position and, by shaking his body, the steel ball was made to roll to the hepatic flexure in the colon and from there through the transverse colon. All during this process, the progress of the foreign body was observed under the fluoroscope. When the patient stood up, gravity carried the metal ball to the anus, through which it was expelled.

TABULATION OF PREVIOUS CASE REPORTS

1. Several nails and pieces of glass removed from the stomach and ileum of a professional nail swallower. Stewart, J. C.: Jour. Am. Med. Assn. 48:2028, 1907.
2. A wooden splinter accidentally swallowed by a four year old boy removed from the ileum. Spence, T. B.: Long Island Med. Jour. 2:65, 1908.
3. A stiff hair bristle accidentally swallowed by a seventeen year old girl removed from the appendix. Spence, T. B.: Long Island Med. Jour., 2:65, 1908.
4. A wire paper clip taken with suicidal intent by a thirty-five year old insane woman removed from the ileum. Ross, G. G.: Ann. Surg., 63:247, 1916.
5. A piece of glass accidentally swallowed, perforated Meckel's diverticulum, producing an umbilical abscess in a five year old boy. Kilgore, F. H.: Med. Rec. and Ann., 17:125, 1923.
6. A wooden toothpick, accidentally swallowed, removed from the cecum of an adult. Ross, G. G.: New York Med. Jour., 86:880, 1907.
7. A steel nail, accidentally swallowed, removed from the duodenum of a twenty-three year old man. Mairane, M.: Adch. Ital. di Chir., 7:502, 1923.
8. A hairpin, swallowed with suicidal attempt, removed from the duodenum and gallbladder of a thirty-one year old prisoner. Arch. f. Klin. Chir., 128:437, 1924.
9. A pin, accidentally swallowed removed from the duodenum. McCartney, F. M.: Denver Med. Times, 27:359, 1907-08.
10. Several teaspoons removed from the stomach of a twenty-nine year old insane woman. Balfour, D. C.: Jour. Am. Med. Assn., 66:421, 1916.

URETERAL STONE WITH PERIURETERAL EXTRAVASATION

ARTHUR N. COLLINS, M.D., and GAGE CLEMENT, M.D.
Duluth, Minnesota

We have not been able to discover in the literature any recorded cases of non-traumatic ulceration or perforation of the ureter. Young and Waters* have shown two radiographs of extravasation of the pyelographic medium into the retroperitoneal space, but both of these cases are the result of puncture of the ureter by the ureteral catheter. The case which we report herein shows extravasation of the medium into the retroperitoneal space through an opening in the wall of the ureter caused by a sharp calculus.

The essential points in the history are as follows:

H. M., a male, aged 58, was seen by Dr. S. H. Boyer, and admitted to St. Luke's Hospital September 12, 1930, complaining of knife-like pain in the left side of the abdomen. His first attack came on three weeks preceding admission and lasted one and one-half hours. Since that time he had had difficulty in starting urination. He complained also of frequency and burning. These symptoms occurred only at night, although he was unable to tell at any time whether or not the bladder was completely empty. Eight days preceding admission he had a recurrence of the pain and it had continued intermittently ever since. There was no evidence of hematuria or cloudy urine.

Physical examination was essentially negative except

*Young and Waters: Urological Roentgenology, pages 357 and 363.

that the teeth were poor, showed pyorrhea and had many fillings. The left lower abdomen was rigid and tender, especially in the left iliac region. The left flank was tender and spastic. The lumbar muscles on the left side were prominent, spastic and very tender to deep percussion.

the ureter. There was evidence of light, crisp adhesions from inflammation in the neighborhood of the left kidney and ureter. These adhesions were easily separated. The kidney was apparently normal. The ureter was slightly thickened and there was induration of the tissues around it. The stone was located in the ureter

Fig. 1

Fig. 2

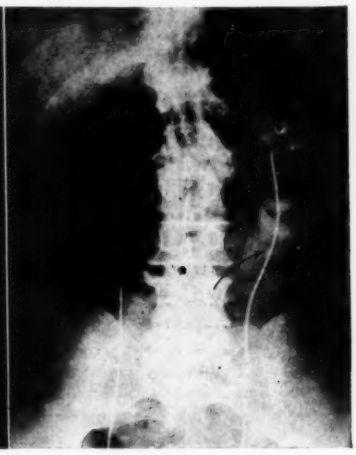

Fig. 3

On admission the temperature was 98.6, pulse 86, respiration 18. Urine showed a trace of albumin, an occasional leukocyte and many erythrocytes. The red blood cell count was 4,300,000 and the white count was 12,100. Blood urea was 18.9 mgs. and creatinin 1.8 mgs. Stereo-roentgenographs of the abdomen showed a small opaque area about 8 x 4 mm. situated in the path of the left ureter just opposite the upper border of the fourth lumbar body. It was diagnosed as probably a ureteral stone (Fig. 1).

On ureteral catheterization the pyelogram showed the same opacity lying just beside the catheter in the same relative position. Urine from the right kidney was clear and showed microscopically an occasional epithelial cell with one or two erythrocytes per high power field. Urine from the left kidney was clear and showed a few leukocytes with twenty-five to forty erythrocytes per high power field. The pyelogram (Fig. 2) showed no change in the position of the stone, negative calices, and negative kidney pelvis. There was some extravasation of the filling medium into the retroperitoneal space extending in a diffuse cloud from the kidney pelvis to the crest of the ilium. It seemed improbable that the kidney could be so large and still not show some deformity of the calices, especially in the lower pole. The arrangement of the shadows caused by the medium was such as is often seen in infiltration into soft tissue and not into one well defined cavity. The filling medium was withdrawn from the kidney pelvis immediately after the pyelogram was made. The film (Fig. 3) was taken fifteen minutes after Fig. 2, and showed the kidney pelvis practically empty.

At operation the stone (Fig. 4) was removed from

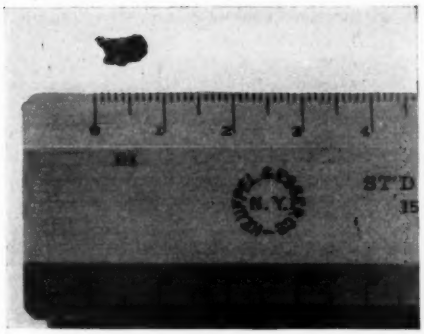

Fig. 4

about 7 cm. below the junction of the kidney pelvis and ureter. It was removed through a small incision in the ureter. The incision in the flank was closed with drainage.

SUMMARY

The pyelograms show the ureteral catheter in the kidney pelvis. The kidney pelvis was well filled with opaque medium, the catheter entered the ureter easily, the extravasation occurred around the ureter at the point where the stone was located. Suction through the catheter removed the filling medium from the kidney pelvis but not from around the ureter. The stone was not displaced by manipulation. It had a sharp point which could have penetrated the ureteral wall. The surrounding tissues at operation showed evidence of inflammation indicating an extravasation from the ureter.

PRESIDENT'S LETTER

IT IS frequently stated, especially by social writers and the press, that the medical code of ethics is outworn, obsolete and absurd. Leaving the reasons for so thinking out of consideration one is none the less moved to wonder just what is meant by the term medical ethics.

The terms ethics and morals are of very similar, if not precisely the same meaning. The former term derives from the Greek and means right conduct; the word morals is from the Latin and likewise means right conduct. Thus we may conclude that ethics concerns itself with the rightness and wrongness of things, decency as against indecency, the moralities and the immoralities. We must not confuse the social amenities, the conventions and mere etiquette, with ethics. These latter are but a polish, very pleasing to encounter and well calculated to grace social intercourse, but superficial withal. They may connote the cultured gentleman or but cloak the true character of a most unethical, immoral or unmoral scamp. Ethics is the product of character. Character determines conduct. Conduct may bespeak character but it does not make it.

No one of character needs to be told what constitutes honor and decency and fair dealing between individuals. Such a person knows these things instinctively. It is rather the broader aspects and applications of ethics that challenge our understanding. From time immemorial the ethical relation between physician and patient has been that of placing the patient's feelings, interests and physical welfare above everything else; an accepted rule of conduct that at times calls for no small degree of self abnegation, and when faithfully followed by physicians is found to eliminate personal differences between them and establish bonds of confidence and friendship. Such practice can never be obsolete nor absurd.

Our ethical relations to the public and our duty to ourselves are indeed puzzling at the present time, and this applies not alone to the medical profession but to practically all other callings. Social conditions are forever changing and that means adaptive ethical changes also. The latter sometimes lag but they will always come, just so long as fineness of character exists. Our critics might do well to note the difficulties existing in their own fields of endeavor before telling the medical profession how to correct theirs.

Advance in knowledge and industry has resulted in tremendous social changes accompanied by a general consciousness of the desirability of what is called social service. This is the point at which our ethical uncertainties begin. The whole-time clinical teaching in our medical schools, public health nursing, social service nursing, health centers, public health education, preventive medicine both lay and official, the free and the pay clinic, compulsory industrial insurance, actual curative and corrective medicine practiced by the state and a host of similar changes and allied movements have wholly changed the face of the practice of medicine. The changes compel adaptive changes in medical ethics.

How we shall meet these changes with moral integrity is our problem. No one man, no group of men, can at this time effect a solution out of hand. All through the variations of the present and the future the great thing that concerns us as doctors, and also the public, is the preservation of a united well organized profession, high ideals, a never failing opportunity for professional advancement, and of financial reward commensurate with the value of professional attainments and of services rendered.

The holiday season is at hand and your retiring president takes pleasure in offering your succeeding one every felicitation and such aid as he may desire; in hoping that we may gradually find our way out of the maze in which we find ourselves today; in extending to all the seasons greetings, a Merry Christmas and a Glad New Year.

S. H. Boyer

President,
Minnesota State Medical Association.

EDITORIAL

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Vol. XIII December, 1930 No. 12

THE ANTI-VIVISECTION BILL

Again the subject of vivisection. For many years the anti-vivisectionists have been striving to prohibit vivisection by legislation. Some forty bills have been presented to Congress during this period but never until now have they been able to get a committee recommendation of a bill, the previous bills having died in committee. So vigorous and persistent have their efforts been that finally they have succeeded in obtaining recommendation by the committee of the house, of a bill to prohibit experimentation on dogs in the District of Columbia. The cleverness of limiting the proposed law to the use of the dog is an appeal to the emotional nature of man, for the dog has always been man's particular pet. It is obvious that the enactment of this proposed bill would serve as a powerful entering wedge for the extension of similar legislation throughout the states of the union.

The question of the advisability of such a law should be approached from a common sense viewpoint and emotionalism should not be given too much consideration.

Have experiments on dogs added anything to the alleviation of human suffering and to the prolongation of human life? If so, there should be considerable hesitation before prohibitive legislation is enacted. Experiments on dogs were responsible for two outstanding triumphs in the field of therapeutics in recent years. The development of insulin in the treatment of diabetes and the discovery of the value of liver and liver extracts in pernicious anemia were the result of work done chiefly on dogs. Both remedies have relieved the symptoms and have prolonged the lives of thousands of human beings afflicted with these diseases. The results in these two instances alone have added much to the justification of vivisection. Mention might be made of the work that is being done in the prevention of distemper in dogs which promises to be effective. How will any method be evolved to prevent this disease which has proven to be such a scourge to the canine species in particular, if all experimentation on dogs is prohibited?

That needless animal experimentation is performed is admitted. That needless cruelty to animals has at times accompanied animal experiments is also admitted only to be severely condemned. We have, however, the word of Dr. Carlson, the eminent physiologist of Chicago, who is posted on the facts in the case, that such instances amount to only a fraction of one per cent of all experiments conducted. Doctors are similar in certain respects to any other group of mortals and among them are numbered a few who are lacking in human compassion.

A grave responsibility rests in the hands of those who supervise animal experimentation in the medical schools and research laboratories.

Experiments should be limited to problems which offer some chance of adding to the sum total of scientific knowledge and then anesthesia should be used.

Needless legislation of the sort mentioned will only put more useless and senseless laws on the statute books. Such procedure is as illogical as amputating an arm to cure a sore finger and will greatly curtail research which is so urgently needed to discover new remedies for the many human ailments in the treatment of which our hands are at present tied.

The logical solution of the problem—and there is a certain problem involved—is regulation of vivisection. Individuals and scientific institutions might well be given permits before they are allowed to carry on animal experiments of any sort, not merely on dogs, and a certain supervision conducted by a branch of the national government.

If the anti-vivisectionists were logical—which they are not—they would direct some of their energy against hunters and trappers. Some of the methods of the latter are notoriously cruel. Certainly anti-vivisectionists should not wear furs and logically should be strict vegetarians. This group includes some well-meaning sentimentalists and not a few men and women of means. They have resorted to emotionalism and, we regret to state, even misrepresentation in fighting fanatically for their ends, which, if attained, will result in grievously curtailing medical progress.

The present bill known as the Zohlman Bill (House No. 7884; Senate No. 4497) will be submitted to Congress, which convenes the first of this month, and will probably not come to vote until about February 1. Physicians realize the importance of defeating such a proposal. Every effort should be made to inform our congressmen of the true facts in the case.

WOMEN'S STATE AUXILIARY

The Women's Auxiliary of the Minnesota State Medical Association was one of the first auxiliaries to be founded. The question of the advisability of starting an auxiliary in Minnesota was fully discussed previous to its organization and the step was taken with the approval of the State Medical Association.

While the members of an auxiliary have few common interests compared to those of a medical society, an active auxiliary can undertake certain well worth-while activities.

Perhaps one of the most important functions of a medical auxiliary is the entertainment of visiting women at the time of medical conventions. This applies, of course, to the units in the larger cities, and the entertainment of the visiting women at the recent International Assembly in Minneapolis is a case in point.

Fully as important a function is the opportunity an auxiliary has for disseminating facts about medicine through its contact with various women's organizations. We are inclined to shut our eyes to the importance of using every channel possible to counteract the vigorous and often malicious propaganda being foisted upon the public by anti-vivisectionists, anti-vaccinationists and similarly minded individuals. The false reasoning and illogical conclusions reached by certain well-meaning, but perhaps often fanatical individuals is certainly in opposition to sane medical progress and detrimental to the public welfare. Continuous, not spasmodic effort to inform the public through every possible agency must be made to counteract the various anti's who seem to be tireless in their energy.

Legislative activities are mentioned as one of the functions of an auxiliary. Lobbying is out of the sphere of women, but members of an auxiliary can be informed as to choice of legislators and can disseminate such information.

We approve the aims of the Women's Auxiliary of the State Medical Association which are enumerated in this issue of the journal, and we offer our assistance in every way possible to further their objectives and make the auxiliary column of interest to members of their organization.

HISTORY COMMITTEE

We have long since returned from our vacation and find our editor has used up the material we furnished him a year ago.

On February last we read in the papers that the Italian Consul in New York wanted a New York barber arrested because he looked and dressed like Mussolini, and the Duce didn't like it. That reminded us that a St. Paul physician was arrested in Switzerland in 1854 as it was supposed that he was Joseph Mazinni, the Italian patriot. He told the Swiss police he was an American physician, so to test him his inquisitors

asked him about yellow fever. When he told them he had never seen a case, they were doubly sure he was an impostor, "as is not yellow fever an American disease?" Of course, in those days to most Europeans America was all alike from Argentina to Quebec. At any rate, he got out of jail after ten days in a small cell on a bread and water diet.

We find these "old Docs" interesting men in many ways. Let Dr. H. M. Workman at Tracy know what medical men lived in your town in the early days and what you know about them.

J. M. A.

NEW AND NON-OFFICIAL REMEDIES

The following products have been accepted by the Council on Pharmacy and Chemistry of the American Medical Association for inclusion in New and Non-official Remedies:

LEDERLE LABORATORIES, INC.

Diphtheria Toxoid

MALTINE COMPANY

Maltine with Cod Liver Oil and Iron Iodide

Amytal.—Isoamylethylbarbituric acid.—Amytal differs from barbital (diethylbarbituric acid) in that one of the ethyl groups of barbital is replaced by an isoamyl group. The actions and uses of Amytal resemble those of barbital. It is proposed as a sedative and hypnotic in the control of insomnia and as a preliminary to surgical anesthesia. Amytal is also supplied in tablets containing 1½ grains. Amytal can be used before local or general anesthesia safely only by those who have had much experience and are familiar with the literature concerning such use. Eli Lilly & Co., Indianapolis.

Pulvules Sodium Amytal, 3 Grains.—Gelatin capsules ("pulvules") each containing 0.2 Gm. (3 grains) of sodium amytal, the monosodium salt of isoamylethylbarbituric acid. The actions and uses of Pulvules Sodium Amytal, 3 grains, resemble those of barbital. The product is proposed as a sedative and hypnotic in the control of insomnia and as a preliminary to surgical anesthesia. Pulvules Sodium Amytal, 3 grains, can be used before local or general anesthesia safely only by those who have had much experience and are familiar with the literature concerning such use. The pulvules may be administered by mouth or rectally. Eli Lilly & Co., Indianapolis. (Jour. A. M. A., October 18, 1930, p. 1178.)

Ampules Emulsion Mesurol, 20 per cent, 1 c.c.—A suspension of mesurol (New and Non-official Remedies, 1930, p. 100) in sesame oil, each cubic centimeter of which contains mesurol equivalent to from 0.103 to 0.117 Gm. of bismuth. Winthrop Chemical Co., Inc., New York.

Tablets Theocin 1 1/2 grains.—Each tablet contains theocin (New and Non-official Remedies, 1930, p. 415), 1½ grains. Winthrop Chemical Co., Inc., New York.

Ampules Mercurochrome-H. W. & D., 1%, 10 c.c.—An aqueous 1 per cent solution of mercurochrome-220 soluble (New and Non-official Remedies, 1930, p. 271) stabilized with ammonium hydroxide; in 10 c.c. ampules. G. D. Searle & Co., Inc., Chicago.

Ampules Mercurochrome-H. W. & D., 1%, 20 c.c.—An aqueous 1 per cent solution of mercurochrome-220 soluble (New and Non-official Remedies, 1930, p. 271), stabilized with ammonium hydroxide; in 20 c.c. ampules. G. D. Searle & Co., Inc., Chicago. (Jour. A. M. A., August 2, 1930, p. 343.)

Diphtheria Toxoid-Cutter.—Diphtheria Toxoid-Cutter (New and Non-official Remedies, 1930, p. 485) is also marketed in packages of one 45 c.c. vial. Cutter Laboratory, Berkeley, Calif.

Synthetic Thyroxine.—It contains not less than 65 per cent of iodine. It has the actions and uses of thyroxin, U. S. P. (New and Non-official Remedies, 1930, p. 403). Synthetic thyroxine is supplied in the form of ampules containing 1.1 c.c. of solution containing 1 mg., and in the form of a solution, each c.c. containing 2 mg., and in tablets containing 1 mg. Hoffmann-La Roche, Inc., Nutley, N. J. (Jour. A. M. A., August 16, 1930, p. 485.)

Antimeningococcic Serum.—Antimeningococcic serum (New and Non-official Remedies, 1930, p. 350) marketed in packages of two 15 c.c. syringes with apparatus for intraspinal injection; in packages of one 50 c.c. double-ended vial with apparatus for intraspinal injection. National Drug Co., Philadelphia.

Mercurochrome Suppository-Aces. — Suppositories representing a 2 per cent solution of mercurochrome-220 soluble (New and Non-official Remedies, 1930, p. 271) in a slightly aromatized, hydroglycero-gelatin base; each suppository weighs approximately 6.5 Gm. (100 grains). Aces Laboratory, Inc., Brooklyn, N. Y. (Jour. A. M. A., August 23, 1930, p. 594.)

White's Cod Liver Oil Concentrate.—A cod liver oil concentrate in the form of tablets (wafers), each containing not less than 250 Vitamin A units and not less than 100 Vitamin D units. White's cod liver oil concentrate possesses properties similar to those of cod liver oil so far as these depend on the fat-soluble vitamin content of the latter. White Laboratories, Inc., Gloucester, Mass. (Jour. A. M. A., August 30, 1930, p. 663.)

FOODS

The following products have been accepted by the Committee on Foods of the Council on Pharmacy and Chemistry of the American Medical Association for inclusion in Accepted Foods:

Argo Corn Starch (Corn Products Refining Co., New York). A refined corn starch of high purity. It contains 86.95 per cent of starch. It yields 3.50 calories per Gm. (99.4 per ounce). Argo Corn Starch is proposed for use in puddings, custards, ice cream, a wide variety of desserts, in bakery products, and for thickening gravies, sauces, pie filling, stewed fruits, etc.

A PAGE FORUM OF THE COMMITTEE ON PUBLIC HEALTH EDUCATION

One of the cornerstones of lay security and trust in the medical profession lies in the fact that the doctor never refuses to come when and where he is needed.

Is it premature labor or the croup or a night of terror? The telephone will bring expert medical help yet—in Minnesota. Such reliance is one of the glories of medical practise earned by untold labor and hardship and not to be surrendered easily so long as the doctor wishes to remain what he has been, the trusted friend, and not the irresponsible hired employee.

But who knows what is to happen to this phase of the traditional practise of medicine if the dangerous state of affairs that exists these days in some of the large centers should spread? The profession in Minnesota has much to be thankful for that it is in Minnesota and not in Chicago or Detroit judging by an editorial appearing recently in the Wayne County (Detroit) bulletin on the subject of "Fake Calls and Badger Games."

The editorial follows:

The profession views with alarm the increase in fake calls made either for the purpose of the robbery or kidnapping of physicians, or the malicious application of the "badger game" to them.

Time was when the physician could go about his duties at any time of the day or night without giving a thought to the possibility of interference of any sort. The respect for his profession, and the personal sacrifices that are entailed in its practice seemed to render him immune as prey for the kidnaper, blackmailer or hold-up man. That time, unfortunately, is no more and it is now necessary to warn physicians repeatedly of the dangers attendant upon calling on those about whom they know nothing.

A few recent happenings will serve to illustrate some of these dangers. The first is the kidnaping of Dr. Frank L. McPhail of this city when he responded to the call of a supposed patient. Next is the "enraged husband" act reported from New York City, which is put over on doctors who have responded to the call of a "sick" woman alone in a hotel room where the irate husband rushes in as the doctor is about to make an examination; and finally there is the accusation of assault made by a female narcotic addict against the physician who refuses to administer morphine. All of these incidents and many more like them are serving to make physicians exceedingly wary and while no restraint has been or ever will be placed on the exercise of the doctor's judgment in deciding on whom to call or not to call, the time is rapidly approaching when the taking of chances will be reduced to a minimum by the men themselves.

It is regrettable that such a state of affairs exists for it works a hardship on those who have legitimate need for the services of a physician, yet nothing can be done about it since the risks involved make the refusal to call anywhere at any time thoroughly justifiable.

OF GENERAL INTEREST

Dr. L. T. Sussex of Rochester, Minnesota, is now located in Havre, Montana.

Dr. Edward Waldemar Anderson, formerly of the Mayo Clinic, Rochester, is now living in Hanover, New Hampshire.

Dr. E. E. Kidder has moved from Hibbing, where he was a member of the staff of Rood Hospital, to Stevens Point, Wisconsin.

Dr. Ralph Garfield Mills, formerly of Rochester, Minnesota, is now associated with the Wiley-Smith Clinic, Fond du Lac, Wisconsin.

Dr. Emil Geist, Minneapolis, returned on Friday, October 24, 1930, with Mrs. Geist, from Paris, where he has been attending the meeting of the International Orthopedic Society.

The publication of the November issue of MINNESOTA MEDICINE was considerably delayed on account of the moving of the printing plant from 2429 University Avenue to 2642 University Avenue, Saint Paul.

Dr. F. C. Rodda, Minneapolis, addressed the Scott-Carver County Medical Society at Montgomery, November 11, on Pediatrics. Dr. W. A. Fansler, also of Minneapolis, talked on Hemorrhoids. Dr. Thomas P. Martin of Arlington was elected to membership in the society.

J. A. Myers of Minneapolis addressed the following societies during the month of November: McLean County Medical Society in Bloomington, Illinois, on November 6, and Illinois Tuberculosis Association in Jacksonville, Illinois, on November 7; the Iowa Tuberculosis Association, the Iowa Pediatric Association, the Des Moines Academy of Medicine and the Polk County Medical Society, all of Des Moines, on November 14.

Following his return from Philadelphia, Pennsylvania, where he did two years' post-graduate work in surgery at the University of Pennsylvania Post Graduate Medical School, Dr. Brand O. Leopard has formed an association with Dr. W. B. Richards, whose practice is limited to pediatrics and obstetrics, and has opened offices with him at 306 Granite Exchange Building, Saint Cloud, Minnesota, for the practice of surgery and general medicine.

On October 6, 1930, at a dinner meeting of the Medical Assembly, a recently organized group of younger physicians in Saint Paul representing the specialties, the following officers for the year were installed: Gordon R. Kamman, president; Richard B. Hullsiek, vice president; James J. Swendson, secretary-treasurer. Drs. Joseph E. Borg and Richard B. Hullsiek addressed the society on "The Use of Potassium Sulphocyanate in Hypertension" and "Hematuria as a Symptom."

A banquet was tendered Dr. L. L. Sogge on November 14, 1930, in honor or his election to the presidency of the Minnesota State Medical Association. The banquet, graced by Dr. A. G. Chadbourn as toastmaster, was held at Memorial Hall, Fulda, Minnesota, and was attended by some seventy doctors and their wives. The dinner was served by members of the local auxiliary, and vocal and cello solos were given by Mrs. Engh and Mrs. Stratte. Dr. S. H. Boyer, retiring president of the association, spoke on "The Significance of State Medicine." Dr. H. M. Workman spoke on the work and personnel of the State Association and Dr. H. M. Johnson of Dawson explained some of this work being done by the association. Mr. F. M. Brist, attorney for the State Board of Medical Examiners, spoke on the Basic Science law and the recent suit which established its constitutionality. Dr. F. H. Aldrich of Belview rehearsed some of the activities of the Legislative Committee and greetings were brought from Iowa by Dr. Hoff of Sibley.

The 1930 Christmas Seal sale serves to call attention to certain important late developments in our knowledge of tuberculosis. The most interesting of these is probably our newer knowledge of the significance and character of childhood tuberculosis, upon which the campaign for the sale of Seals is laying particular stress this year.

Emphasis in the tuberculosis campaign now has turned to the detection of the childhood type of the disease. Such detection depends, in its turn, upon widespread, well directed public education as well as upon the doctor in his private practice.

It has always been the principal work of the Christmas Seal organization to carry on the education of the public in the latest methods of control of tuberculosis. It has carried on the campaigns of education by means of literature, lectures, newspapers, magazines, and demonstrations of needed activities, and in all these activities it has the hearty interest and cooperation of the medical profession in this state.

There is a unique coalition in Minnesota between the organized medical profession and the Christmas Seal organization. As a result, the health information broadcast under public health association auspices is medically supervised, authentic, proper, and designed to serve the best interests of both public and physician. This fruitful coöperation has provided important and valuable short courses in tuberculosis for the physician, the latest held recently at the state sanatorium at Ah-Gwah-Ching. These, too, were financed by Christmas Seal funds.

The Christmas Seal campaign deserves the wholehearted support of the medical profession and throughout the state physicians are taking an active part in both the fund raising and educational phases of the campaign.

Tuberculosis, despite the fact that the death rate for all age groups has been cut in half, still ranks first as a cause of death in that important age group from fifteen to forty-five years.

CONSULTATION BUREAU

WM. A. O'BRIEN, M.D., *Director*
Minnesota State Medical Association
11 West Summit Avenue
Saint Paul, Minnesota

1. *Question.*—I want to get your advice as to treatment in the following case: A married woman, age 30, whose past history is essentially negative, developed an acute bilateral iritis; about a week after this attack pain developed in the dorsum of her left foot. The pain was very severe but there was very little swelling. During the next three days the right knee joint became involved. This was soon followed by the left knee joint, and indefinite involvement of both wrist joints. It is now a little over three weeks since the foot became involved. The swelling of the joints has practically subsided but she is still having unbearable pains in her right knee and left foot. I have tried to immobilize the knee by putting the leg in a splint but was unsuccessful in relieving her pains except for a very short time. Salicylates were pushed with no apparent relief. Her iritis has shown some improvement with constant recurrences. Now the question arises whether I would be justified in using typhoid vaccine (foreign protein) intravenously. Should the vaccine be diluted before giving it by the intravenous route? What other form of treatment would be of benefit in this case?

   Answer.—1. Atropine, one per cent, in each eye, sufficient to keep them properly dilated; smoked glasses to be worn in bright light, and intermittent hot packs. Sodium salicylate, available in ampules containing 15½ grains in solution, should be given intravenously, one ampule at intervals of five days until improvement sets in. If this does not bring about sufficiently speedy results, foreign proteins in the form of typhoid-paratyphoid a and b can be used intravenously, beginning with a dosage of ⅓ minim in 2 c.c. of sterile water. For this the patient is hospitalized for twenty-four hours and no breakfast allowed, the injection being made during the forenoon. The resultant chill and fever are treated symptomatically as required. The rise in temperature should be noted and subsequent dosages determined in accordance with the elevation. Subsequent dosages are usually ½ and ¾ minims at intervals of three to four days.

   2. The case history suggests a Neisserian infection. The iritis, of course, should be treated with atropine solution strong enough to keep the pupil dilated. Hot bathing of the eye should also be done. I think it advisable to have a complement fixation test and if a Neisserian infection is present, to give a vaccine. The foreign protein typhoid given intramuscularly or subcutaneously would probably be of benefit through the reaction following, and the high fever. The history would indicate a general type of infection rather than an infection due to infected teeth or tonsils or syphilis.

2. *Question.*—I have under my care a young man 22 years of age who has a chronic gonorrheal anterior urethritis. There is no burning on urination and no frequency, but there is a persistent morning discharge if the patient milks out the urethra, and likewise there is a persistent shreddy first glass with clear second and third glasses. Prostatic massage does not yield any discharge. There are no symptoms of prostatic involvement. The treatment I have been using is irrigations with 1–5,000 potassium permanganate solution followed by injection of 5% neosilvol and pyridium, two 0.1 gram tablets t.i.d. The results of this treatment after two months are still unsatisfactory. Can you suggest any further therapy?

   Answer.—The history and reported findings support the diagnosis "chronic urethritis." That the process is confined entirely to the anterior urethra is not so certain. Effective prostatic massages will always yield secretion which can be milked out to the meatus and collected for microscopic examination. A number of massages may be required before the material is finally forced through occluded ducts. To avoid misinterpretation as to the source of the contents of the secretion, the prostatic massage and collection of secretion should be carried out only after exudate in the urethra has been flushed out by voiding or by a urethral irrigation. Pus cells in the secretion indicate an inflammatory process in the prostate. This requires treatment by Kollman dilations, prostatic massages and antero-posterior irrigations. Hot rectal irrigations are also useful in the acute stages. In only a limited number of cases will the treatment thus far employed be effective in completely clearing up infection confined to the anterior urethra. Infected periurethral glands (littritis), surface granulations and mural infiltrations occur in a large proportion of cases and would explain the findings reported. These conditions are effectively treated by massages of the urethra over sounds, the passage of sounds of increasing size up to F 30 and by anterior injections of 2% mercurochrome.

3. *Question.*—The following case has stubbornly resisted treatment since coming under my observation: Male, age 40, married, the father of two children aged four and two, living and well. He is a farmer, well built and well nourished, and strong. No history of any illness until three years ago when he was laid up over three months with acute articular rheumatism. Since then he has had occasional pain in the joints once in a while, but not sufficient to need attention. Last week while haying he got something into his right eye. It was very sore and red. Two weeks later when he came to my offce I found a marginal ulcer of the right cornea in addition to the general redness and inflammation. Tonsils were enlarged and crypts filled with whitish and yellow matter. Teeth pyorrheic. Advised *x*-ray and report from the dentist stated no sign of abscess. Tonsils removed under general anethesia two weeks ago. Good recovery. Urinalysis normal. Blood pressure 169/90. Have been giving him autocondensation at the office every other day the past week or two. Locally warm, wet applications, atropine, novocaine with adrenalin ointment, alternated with butyn and metaphen ointment. Also local eye wash of boric acid with zinc sulphate and aqua camphor. Internally he has been getting protonuclein tablets, now discontinued. Now getting KI, grains X, t.i.d. pc. Also cinchophen, grains V, t.i.d. Anything you

(Continued on Page 928)

MISCELLANEOUS

GETTING INTO PRINT: AN EXHIBIT FOR MEDICAL WRITERS*

It seems desirable that investigators who are producing material for publication should know of the attention that all they write requires. Information of this sort might result in shorter papers, elimination of non-essential illustrations, and fewer corrections in proof.

*From the Division of Publications, The Mayo Clinic, Rochester, Minnesota.

For the annual intramural exhibit at The Mayo Clinic, a replica of an open book, represented in the accompanying photograph, was constructed of wood and wall board. The book was 6 feet tall and 8 feet wide over all. Forty-two pictures were drawn or adapted to illustrate consecutive essential steps in getting an article into print. These pictures were pasted on the surfaces that represented opposing open pages of the book. The book stood against a wall on a shelf placed 20 inches above the floor, and occupied 22 inches of horizontal space.

RICHARD M. HEWITT, M.D.

The replica of the open book. Because of reduction, the numerals and legends of the drawings are difficult to read. They are as follows: 1. Author preparing his paper. 2. Author dictating. 3. Author's secretary typing. 4. First editor in editorial department of clinic. 5. Second editor in editorial department of clinic. 6. Typist in editorial department of clinic. 7. Manuscript proof readers in editorial department. 8. Making corrections on manuscript in editorial department. 9. Author reading final manuscript. 10. Inserting author's corrections in editorial department. 11. Manuscript off to publisher. 12. First editor in publishing house. 13. Second editor in publishing house. 14. Copy editor in publishing house. 15. Foreman of composing room. 16. Linotype operator setting article. 17. Boy making galley proof. 18. Proof readers in publishing house. 19. Linotype operator setting corrections. 20. Printer inserting corrected lines. 21. Boy making second galley proof. 22. Verifying corrections on galley proof. 23. Author's proof back to editorial department of clinic. 24. Examining author's proof in editorial department of clinic. 25. Author examining galley proof. 26. Examining author's changes in editorial department of clinic. 27. Author's proof off to publisher. 28. Editor in publishing house examining author's corrections. 29. Linotype operator setting author's corrections. 30. Printer inserting corrected lines. 31. Make-up man making pages. 32. Boy making page proof. 33. Editor in publishing house examining page proof. 34. Editor-in-chief in publishing house examining page proof. 35. Linotype operator setting corrections. 36. Make-up man inserting corrected lines. 37. Stereotyper. 38. To press. 39. Binder. 40. Mailers. 41. The issue of the journal on its way. 42. Author reading his article.

MINNESOTA STATE BOARD OF MEDICAL EXAMINERS

STATE OF MINNESOTA *vs.* MASON

On November 12, 1930, the above defendant, Elmer Mason, entered a plea of guilty of practicing healing without a Basic Science certificate before the Honorable Judge Gates at Winona, Minnesota.

Mason was the ringleader of a group of Indian doctors who, during July and August, sold between four and five thousand dollars' worth of Indian roots and herbs to the citizens of Fillmore and Houston Counties.

Another member of the group has completed a sixty day sentence in the county jail of Houston County.

Judge Gates, after hearing the facts in the case, sentenced Mason to serve three months at hard labor in Houston County. This sentence means that Mason will be put to work in the rock quarry where Houston County obtains the material for its roads. Sentence like this will go a long way toward preventing any return of quacks in that part of the state.

Judge Gates is to be commended for his firmness in the disposition of this matter.

Mr. Brist representing the State Board of Medical Examiners reports the finest of coöperation from Mr. Flynn, the County Attorney, and Sheriff Brown.

HOSPITAL CHART OWNERSHIP

The following letter written by Mr. F. M. Brist, attorney for the Minnesota State Board of Medical Examiners, contains legal opinion in answer to several questions which are likely to occur to physicians and hospital authorities and therefore merit publication:

September 15, 1930.

J. P. McDowell, M.D.,
St. Cloud, Minn.

Dear Dr. McDowell:

In answer to your two previous written inquiries concerning the ownership of a hospital chart and certain other questions concerning the rights and liabilities of the hospital in connection therewith I set out below your questions, the answers thereto and my reason for the same:

Q. 1. To whom does a hospital chart belong?

A. To the hospital.

Q. 2. May a patient demand his chart, read it or take it with him?

A. Any patient may demand his chart, that is, he may demand to read it or take it with him, but it is my opinion that his demand does not need to be complied with. As a matter of general policy I would advise that a patient while a patient of a hospital be permitted to see his chart if he so requests but under no circumstances would I permit him to take the chart with him.

Q. 3. If a Court's order is obtained, then is the chart to be turned over to someone outside the hospital or does a hospital representative take the chart to the court room and keep it in her or his possession and take it back to the hospital when the Court has finished with it?

A. If a subpena duces tecum is served upon the superintendent of a hospital, that subpena requires the appearance of the person named in the subpena, usually the superintendent, in Court at a specified time, together with the records described in the subpena. Therefore the chart under no circumstances should be turned over to someone outside the hospital. The hospital representative takes the chart or other record to the court room and keeps it in his or her possession and takes it back to the hospital unless the original record or chart is introduced as an exhibit in the case, in which event the courts usually allow a motion to withdraw the exhibit from the evidence or order its return after the case has been submitted to either the court or jury as the case may be. There are cases where the original exhibit, such as the chart or other records, is not introduced in evidence but upon agreement of counsel the items appearing upon the record or chart are read into the record as part of the evidence after the chart or record has been sufficiently identified to show that it is an authentic record.

Q. 4. May a patient, doctor or anyone else demand a hospital chart and hope to get it without a court order?

A. As previously stated, anyone may demand the chart, but in my opinion it does not need to be surrendered to anyone except as stated above where a subpena duces tecum has been served on the hospital.

Q. 5. May a patient or representative of a patient demand a copy of a chart?

A. The patient or representative may demand a copy of the chart but it is my opinion that such a demand need not be complied with. If such a demand is made the demand itself should be sufficient to put the hospital on an inquiry as to the reason for the demand being made. It is a matter of common knowledge that patients do not demand the hospital chart nor a copy of the same except under unusual circumstances, that is, unless there be an action pending in court either against the hospital, the attending physician, or both, or in cases involving an action under an insurance policy.

Q. 6. Has a second doctor with or without the consent of the patient the right to demand the chart kept of this patient by another doctor at some previous time?

A. Doctor number 2 has a right to make the demand but it is my opinion that the hospital is under no obligation to exhibit or turn over to the second doctor a chart made during the treatment of the patient by a previous doctor. I call your attention to the fact that your question number 6 states that the chart was made by another doctor. I am answering all of your questions on the theory and on the assumption that no chart is made by the attending physician but rather that the chart is made by someone in the employ of the hospital.

The last question in your first letter, "Just whose property is the hospital chart?" This is answered in question 1.

I have very carefully considered the questions personally and I find that we have no statutory law in Minnesota on the subject of the ownership of a hospital chart. In other words there is no statute in Min-

nesota that compels a doctor or a hospital to keep a hospital chart. Section 5362, Mason's Minn. Statutes for 1927, makes it mandatory that "all superintendents, managers or persons in charge of lying-in or other hospitals, almshouses, charitable or other institutions, public or private, to which persons resort for confinement, treatment of disease, care, or are committed by process of law, shall, at once, make and preserve a record of all the personal and statistical particulars relative to the inmates now in, or hereafter admitted to their institutions, that are required to be stated in the certificate of birth and death provided for by this act and on or before the tenth of each month shall file with the state board of health, on a blank provided by such board for the purpose, a report of all births and deaths, or still-births, occurring in such institution during the previous month. If admitted for medical treatment of disease the physician in charge shall specify, in the record, the nature of the disease and where it was contracted."

However, you will note that the information there required to be kept is only that information that is required to be stated in the certificate of birth and death.

Section 4314, Mason's Minn. Statutes for 1927, provides that the records kept by a hospital of the medical or surgical treatment given to an employee in such hospital shall be admissible as evidence of the medical and surgical matters stated therein, but shall not be conclusive proof of such matters.

Section 4314 above quoted applies only to cases coming under the Workmen's Compensation Act. The section quoted is not in the chapter on Witnesses and Evidence. It is to be found only in the chapter entitled Workmen's Compensation Act and is applicable only thereto.

I call your attention to Sec. 9814, Mason's Minn. Statutes for 1927, which provides that every person with sufficient understanding may testify in any action or proceeding, civil or criminal, in Court or before any person who has authority to receive evidence, except as follows:

Sub. 4. A licensed physician or surgeon shall not, without the consent of his patient, be allowed to disclose any information or any opinion based thereon which he acquired in attending the patient in a professional capacity and which was necessary to enable him to act in that capacity.

The question of the ownership of a hospital chart has never been before a court of final resort in this state or a court of last resort in any state in so far as we have been able to ascertain. This makes it necessary for one to go into the history of a chart and the relationship existing between the patient and the hospital.

In the first place the relationship existing between the hospital and patient is a contractual one, the hospital agreeing to furnish certain facilities and certain care while the patient is an inmate of the hospital for reasonable compensation, which compensation may or may not be agreed upon in any definite amount at the time of the admittance of the patient to the hospital. As previously stated there is no statutory obligation on the part of a hospital to keep a chart. The patient comes to a hospital to be cared for while under the treatment of either a private physician or in some cases treatment of a physician in the employ of the hospital. Hospital charts are kept so that the attending physician and those in charge of the hospital may have a better knowledge of the trend of the patient's case from day to day and have knowledge of certain medicinal administrations and other things done for the patient. There no doubt was a time when hospital charts were not kept just as there was a time when fractures were set without *x*-ray pictures being taken. We did not always have available the *x*-ray and no doubt there is work done today without the aid of the *x*-ray. Take a concrete case for example. A patient goes to a hospital to be operated upon for the removal of gallstones; an *x*-ray picture is undoubtedly taken to confirm the diagnosis. The surgeon performs the operation, removes the gall stones; the hospital through its employees ministers to the necessities of the patient. The patient pays for this service, however. The patient did not come to the hospital to buy *x*-ray pictures nor to buy hospital charts. It is true that the cost of rendering that service is included in the patient's bill. The patient did come to the hospital for the treatment and removal, if necessary, of the gallstones. If that service is rendered and the gallstones are removed, whether the patient recovers or not the service that the patient contracted for has been rendered. There is no liability on the part of the doctor nor the hospital if the patient should not recover unless there has been negligence on the part of either the hospital or the attending physician. Such negligence, before liability can be established, must be the approximate cause of the death of that patient.

Another vital reason for the keeping of hospital charts is for the protection of the hospital as well as the attending physician. Patients sometimes do become dissatisfied with the treatment previously given because they develop some further disorder, or perhaps for a recurrence of their former ailment they may prefer to consult another doctor who may or may not criticise the treatment described by the patient as having been previously given. This is one reason why hospitals should maintain a chart and a complete record of the case from start to finish, such record to be the absolute property of the hospital and to be preserved for a length of time at least equivalent to the statute of limitations relating to malpractice suits, and in my opinion for a considerable longer period. I can see no reason based on any sound theory why the second doctor in a particular case should feel that he has an absolute right to even see the chart prepared by the hospital in former treatment of that patient. I would advise, as a matter of business, unless there is some good objection to the contrary, that such a courtesy be extended to the doctors who subsequently treat a patient and in no event should hospital charts be kept where they can be removed or copied, as you mention in your letter of September 5th. If the patient has a meritorious action pending in court and the patient desires the hospital chart he has available a proper manner in which to obtain the same.

Under no circumstances should a hospital at any time be in the position of not having a record of the patient, as you state in your letter. Before a hospital chart is taken to court a copy should be made of that chart and retained by the hospital. There is no reason why any expense incident to the furnishing of a copy of the chart should not be borne by the party requesting the same.

Our Supreme Court has held in the case of Price vs. Standard Life and Accident Insurance Co., 90 Minn. 264, that the entries made by the superintendent in charge of a hospital could not be introduced in evidence because they constitute hearsay testimony and furthermore violated the statute prohibiting the examination by a physician as to certain matters without the consent of his patient.

This matter was before the Supreme Court of Michigan in a case wherein the Mass. Mutual Life Ins. Co. brought a mandamus action against the Board of Trustees of the Michigan Asylum for the Insane to compel the Board of Trustees to permit the insurance company to inspect the records of the asylum. The purpose being to obtain information concerning the mental and physical condition of a patient. Their action was based on the theory that the records of an insane asylum are public records and that at common law public records could be inspected. The Supreme Court of Michigan denied the writ of mandamus and cited the Price case above quoted. The Court held that the information contained in the records was strictly confidential and obtained while the relationship of patient and physician existed.

There is no question but what if the patient desires the matters shown in the record or chart to be aired in court it can be done by simply subpenaing the doctor and the person in charge of the records in the hospital. I would suggest, however, that when the hospital prints its forms for the keeping of these records and charts, a statement be printed upon the face of each one to the effect that the records or the chart, such as the case may be, are the property of the hospital and are not to be altered, copied or removed without the consent of the hospital. I also think that there should be some improvement in the manner in which charts are kept around a hospital. It should be made a very difficult matter for anyone to copy or remove the chart without the consent of the hospital.

It will be seen from the foregoing that the rights of all the parties concerned in this question depend first of all upon the ownership of the chart. It is my opinion for the reasons heretofore stated that the chart belongs to the hospital. As a matter of policy I believe that when requested patients, while patients of the hospital, should be permitted to examine their chart. If such a policy were established it would be conducive to the orderly keeping of the charts and it would lead to the hospital making every effort to keep a correct chart and one that could be proudly and successfully exhibited in Court. I trust that the foregoing will assist in clarifying the situation for you people.

Very truly yours,
(Signed) F. M. Brist.

FELLOWSHIPS FOR TRAINING IN EXTRAMURAL PSYCHIATRY

The following announcement is made by the National Committee for mental hygiene:

Minimum Requirements for Applicants—

These fellowships are designed to provide special training for physicians who have had previous hospital training in psychiatry but who wish to prepare themselves for extramural work in the fields of child guidance, delinquency, education, dependency, and industry.

Fellowships are open to physicians who are:

1. Under thirty-five years of age,
2. Graduates of Class A medical schools, and
3. Who have had at least one year of training in a hospital for mental disease maintaining satisfactory standards of clinical work and instruction. A longer period of hospital training is desirable.

Applicants able to meet these requirements will not be required to take competitive or oral examinations. Selections will be made on the basis of length and type of previous training in formal psychiatry, on general fitness for the work contemplated, and (in most cases) on the results of a personal interview.

General Details of Fellowships—

1. These fellowships cover a period of training approximately one year in length.
2. During this training period trainees usually are assigned for three to four months' periods at such places as the Boston Psychopathic Hospital; Judge Baker Foundation, Boston; Institute for Juvenile Research, Chicago, and other places of a similar nature, as well as to various child guidance clinics located in Cleveland, Philadelphia and other cities. Assignments to these training centers are not definite, however, and assignment to any given place will depend upon the availability of instruction at such place, as well as the special needs of the individual trainee. Assignments are not made for more than three months in advance, and adherence for the year's training period to a fixed program in advance is impossible.
3. These fellowships carry stipends at the rate of $2,000 to $2.500 for the twelve months' period.
4. Applications need not be filed within stated periods but will be received at any time. In the case of successful applicants, arrangements will be made to begin work whenever mutually convenient to the applicant and to the director of the training center to which the applicant is first assigned.

Applications or inquiries for further information should be sent to Dr. Frankwood E. Williams, Medical Director, National Committee for Mental Hygiene, 370 Seventh Avenue, New York, N. Y.

Plant's Magnesia Wafers.—Wafers, each containing magnesium hydroxide 0.3 Gm. (4.64 grains) compressed with the addition of sucrose and starch and essential oils as flavors. Used as an alkaline laxative and antacid. The magnesium content of each wafer is approximately equivalent to that of 4 c.c. of magnesia magma U. S. P. Plant Products Co., Cleveland, Ohio. (Jour. A. M. A., September 27, 1930, p. 935.

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

MEDICAL BROADCAST FOR THE MONTH

The Minnesota State Medical Association
Morning Health Service

The Minnesota State Medical Association broadcasts weekly at 11:15 o'clock every Wednesday morning over Station WCCO, Minneapolis and St. Paul (810 kilocycles or 370.2 meters).

Speaker: William A. O'Brien, M.D., Associate Professor of Pathology and Preventive Medicine, Medical School, University of Minnesota.

The program for the month of December will be as follows:

December 3—Gall Stones.
December 10—Mental Hygiene.
December 17—Christmas Seal.
December 24—Aseptic Surgery.
December 31—Cancer of the Skin.

MINNESOTA STATE MEDICAL ASSOCIATION

The 1931 annual meeting of the Minnesota State Medical Association will be held in Minneapolis at the Nicollet Hotel, May 3, 4 and 5.

This meeting will be the 78th annual gathering of the association dating from 1853, the new date for the founding of the original society accepted by the House of Delegates at the suggestion of the Historical Committee at the last annual session in Duluth.

Plans for a large and important meeting are already being formulated. Resources of the University medical school and hospital will be utilized to the fullest to make it a scientifically memorable meeting.

MINNESOTA RADIOLOGICAL SOCIETY

At a meeting of the Minnesota Radiological Society held at the University Hospital, Minneapolis, Minnesota, on October 25, 1930, the following program was presented:

Roentgen Studies on the Onset of Lobar Pneumonia: Walter H. Ude, M.D., Minneapolis. Discussed by George E. Fahr, M.D., Minneapolis.

Childhood Tuberculosis: Malcolm B. Hanson, M.D., Minneapolis. Discussed by Jay A. Myers, M.D., Minneapolis.

Lympho-Epithelioma: A. U. Desjardins, M.D., Rochester.

Air Injection in the Diagnosis of Lesions of the Colon: Harry M. Weber, M.D., Rochester.

Roentgen Therapy in Carcinomatous Metastases to Bone: K. W. Stenstrom, Ph.D., and L. G. Erickson, M.D.

An informal dinner was held at the Town and Country Club, Dr. W. A. O'Brien acting as toastmaster. The Society was honored by the presence of two distinguished guests, Dr. James M. Martin of Dallas, Texas, and Dr. Bernard H. Nichols of Cleveland, Ohio. The following papers were presented:

Significance of Small Intestinal Gas in the Diagnosis of Bowel Obstruction: Edward Schons, M.D., St. Paul.

Clinical and Experimental Studies on Intestinal Obstruction: Owen H. Wangensteen, M.D., Minneapolis.

Intravenous Urography: Bernard H. Nichols, M.D., Cleveland, Ohio.

At the business meeting new officers were elected for the coming year as follows: Dr. B. H. Kirklin of Rochester, president; Dr. Gage Clement of Duluth, vice president, and Dr. Leo G. Rigler of Minneapolis, secretary-treasurer.

The time and place of the next meeting will be decided by the Executive Committee at an early date.

Leo G. Rigler, *Secretary.*

WOMEN'S AUXILIARY
Minnesota State Medical Association

Officers

Mrs. S. S. Hesselgrave	President	St. Paul
Mrs. James Blake	President-Elect	Hopkins
Mrs. Roy Andrews	First Vice President	Mankato
Mrs. F. J. Elias	Second Vice President	Duluth
Mrs. C. S. Sutton	Third Vice President	St. Cloud
Mrs. E. S. Boleyn	Recording Secretary	Stillwater
Mrs. Edward Schons	Corres. Secretary	St. Paul
Mrs. A. W. Coventry	Treasurer	Duluth
Mrs. John Catlin	Auditor	Buffalo

Committee Chairmen

Mrs. James Blake	Organization	Hopkins
Mrs. Hugh J. Tunstead	Legislative	Minneapolis
Mrs. Ben F. Davis	Public Relations	Duluth
Mrs. A. A. Passer	Editor	Olivia
Mrs. Carl Larsen	Finance and Budget	St. Paul
Mrs. E. A. Meyerding	Press and Publicity	St. Paul
Mrs. C. C. Chatterton	Social and Program	St. Paul
Mrs. J. R. Peterson	Social and Program	Minneapolis
Mrs. W. J. Byrnes	Parliamentarian	Minneapolis

Presidents of County Auxiliaries

Blue Earth County	Mrs. J. S. Holbrook	Mankato
Camp Release	Mrs. A. A. Passer	Olivia
Hennepin County	Mrs. James Blake	Hopkins
McLeod County	Mrs. T. J. Trutna	Silver Lake
Park Region	Mrs. W. W. Drought	Fergus Falls
Ramsey County	Mrs. E. M. Hammes	St. Paul
Red River Valley	Mrs. H. Froelich	Thief River Falls
Rice County	Mrs. A. M. Hanson	Faribault
Stearns-Benton	Mrs. Warner Hemstedt	St. Cloud
St. Louis County	Brs. F. N. Knapp	Duluth
Washington County	Mrs. J. W. Stuhr	Stillwater
West Central	Mrs. C.F. Ewing	Wheaton
Wright County	Mrs. John Catlin	Buffalo

The tentative plans of the Women's State Auxiliary include:

1. The organization of twenty-three auxiliary societies (thirteen now organized).

2. Legislative Committee activity at the call of the Legislative Committee chairman of the State Medical Association when needed during the session of the legislature, a legislative chairman to be appointed in each county.

3. Health education through parent-teacher associations and other clubs by means of medical literature and lectures. The placing of health journals in schools and libraries.

4. The establishment of loans for medical students and nurses. Several county auxiliaries have made loans to student nurses, an activity recommended by both state and national auxiliaries.

5. Assisting county health units in Christmas seal sales.

6. Increasing the present membership of 838. Minnesota now ranks third among the state auxiliaries.

Mrs. S. S. Hesselgrave, Saint Paul, president of the Women's Auxiliary of Minnesota, and Mrs. James Blake, Hopkins, second vice president of the National Auxiliary, attended the executive board meeting of the National Auxiliary in Chicago, Friday, November 14, 1930.

Mrs. James Blake, president-elect, and former editor of the State Auxiliary, has turned over her work to Mrs. A. A. Passer of Olivia, who with the able coöperation of Mrs. E. A. Meyerding of Saint Paul, chairman of Press and Publicity, will have supervision of the Auxiliary column in MINNESOTA MEDICINE. The assistance of all local county auxiliary editors in sending in clippings of social and other activities of the auxiliary societies is requested.

HENNEPIN COUNTY AUXILIARY NEWS

The members of the Auxiliary of the Hennepin County Medical Society were hostesses to the visiting wives and daughters of the physicians attending the International Medical Assembly the week of October 20th to 24th. Mrs. Stephen Baxter was the general chairman for the entire week, with a group women assisting for the various activities. Mrs. Martin Nordland had charge of registering the guests. She reports 311 women (not including Minneapolis and St. Paul) given badges from her desk. These women were from thirty-two states and eight different locations in Canada.

Many social affairs—teas, luncheons, dinners and drives were planned for the visitors and were much enjoyed by guests as well as hostesses. The Ramsey County Auxiliary gave a musical tea and drive in compliment to the guests of the Hennepin County Auxiliary which was one of the outstanding features of the week. A rest room and lounge furnished by one of the Minneapolis stores at the Auditorium served as a rendezvous for both doctors and their wives. The Hennepin County Medical Library rooms were turned over to the women for the week, and were used for much informal entertainment all during the Assembly, including a tea on Tuesday and a bridge party on Friday.

This is the first time in the history of the International Assembly that an Auxiliary has taken over and entertained the ladies attending the meeting. The innovation proved a success, so much so, that the doctors in charge of the program decided to adopt the idea as a regular feature, and the Auxiliary in Milwaukee next year will be approached to do the same stunt, and the Hennepin County women wish them "good luck."

(MRS. JAMES) AGNES BLAKE.

PROCEEDINGS OF THE MINNEAPOLIS SURGICAL SOCIETY

Meeting of October 2, 1930

The regular monthly scientific meeting of the Minneapolis Surgical Society was held in the lounge of the Hennepin County Medical Society in the Medical Arts Building on Thursday evening, October 2, 1930, at 8 o'clock, Dr. A. T. Mann, President, presiding.

The meeting was called to order by the President, Dr. A. T. Mann. There were 21 members and 2 visitors present.

Minutes of the May meeting were read and approved. The Committee on revision of the Constitution and By-laws reported the changes which had been made, and a motion was carried that these be approved as read.

The scientific program consisted of two case reports and a thesis.

Dr. O. W. YOERG reported a case of Actinomycosis of the Abdomen.

The patient is a woman 44 years of age. Her past history is negative. She is the mother of four children, the youngest eight and the oldest fourteen. Her history was negative until February, 1928, when she was taken with what appeared to be an attack of acute appendicitis. An abscess was found, the appendix was removed and drainage instituted. She had a normal convalescence. The wound healed within four or five weeks and remained healed. She went back to her home on a farm and continued well for almost two years. She then went to her home doctor complaining of pain and a swelling in the right abdominal wall to the left and a little above the old appendix scar. The doctor watched her for a few weeks and then opened the indurated swelling and found a thin serous pus. That was in December, 1929.

In January, 1930, Dr. Yoerg saw her and his first impression was that a piece of gauze or something had been left in the abdomen at the time of operation. Under local anesthesia he opened the abdominal wall widely and found a number of sinuses and abscess cavities. Sections were taken and Dr. Smith, pathologist at Northwestern Hospital, reported nothing more than inflammation of a chronic type. The condition improved and finally healed. Two months later the patient developed a mass on the left side of the abdomen. This was hard and as it became larger her doctor opened it and found several abscesses on the abdominal wall. In April, 1930, Dr. Yoerg again opened the abdominal wall on the left side, this time under general anesthesia, and found sinus after sinus. Several sections and also some pus were taken at this time, and again the report came back from the laboratory that it was inflammatory. Dr. Yoerg stated that the diagnosis uppermost in his mind was a foreign body; it did not appear to be tuberculosis. He wished to state, however, that he had thought of actinomycosis and had looked for the granules but had found none.

In June, 1930, the patient returned to Northwestern

Hospital. She was anemic and complained of pain in the right leg. There were numerous sinuses over the abdominal wall. Gastrointestinal *x*-rays made at this time were negative. The leukocyte count was about 10,000; temperature ranged from 99.5° to 102° and 103°. A number of men saw her, among them Dr. Bulkley, who confirmed Dr. Yoerg's diagnosis of a foreign body. The abdomen was again opened and an abscess was found. Inside this abscess cavity was a mass which shelled out very readily; this mass appeared to be ovary, but on opening was found to be infiltrated with pus. This specimen was sent to the laboratory. Unfortunately a fecal fistula formed after this operation. On account of Dr. Smith's absence, the specimen was sent to Dr. Drake at the Swedish Hospital. About a week later Dr. Drake reported to Dr. Yoerg that he had found the ray fungus in the specimen. Since then Dr. Yoerg had also found a granule, the only one he had been able to find so far in the case.

The woman is still in the hospital and has considerable edema in the right leg although the pain has been less. Her hemoglobin is down to about 30 per cent. She was put on potassium iodid but did not tolerate it. This was discontinued and she was put on Lugol's, which she tolerates very well. In addition to this medication, Dr. Allison has given her four doses of deep *x*-ray therapy. The fecal fistula closed in about three weeks and since then the patient has apparently been holding her own. Dr. Yoerg said, however, that yesterday he could feel a mass just above the bladder.

Dr. Yoerg stated that his reason for reporting the case was that abdominal actinomycosis is rare, especially in women. The best information he could find was in an article by Sanford of Rochester, who had collected reports from various hospitals and Boards of Health and had found 690 cases reported in the United States up to 1926. Out of this number 80 per cent were in men. And only about 18 to 20 per cent of all actinomycosis is abdominal.

DISCUSSION

Dr. Willard White asked Dr. Yoerg if he had used copper sulphate in this case.

Dr. Yoerg stated that Bevan, in Chicago, was the first man to use copper sulphate extensively, but some men seem to think it does not change the results. He also stated that actinomycosis rarely follows the lymphatics; it goes by extension and may invade the veins; but whether or not the lymphatics are entirely free, he did not know. It does follow along tissue contiguous to the lymphatic.

Dr. E. K. Green asked Dr. Yoerg's opinion as to the portal of entry.

Dr. Yoerg replied that this is open to question. Some authorities claim that it is not transmitted from cattle to man; whether it is or is not, is a moot question. It is found in some grains and grasses and it is thought that people pick up and chew the grasses and the disease enters the system in that way. The usual case, of course, is "lumpy jaw." Most of the abdominal cases which Dr. Yoerg had found reported gave a history of having had an operation for appendicitis. In his own case just reported, Dr. Yoerg said there is a question in his mind as to whether the condition was there at the time of the appendicitis operation, since the patient had recovered and had remained well for almost two years.

Dr. O. H. Wangensteen stated that they had had two cases of abdominal actinomycosis at the University Hospital. A lethal outcome obtained in both instances and he understood that to be the usual occurrence in most instances of abdominal actinomycosis. The usual origin of the abdominal type is in the cecum; infrequently, however, as Bruce of Toronto has pointed out, the disease in the cecum itself heals, leaving no vestige of its previous existence there, but an induration of the abdominal wall and sinuses persist. This form of the disease is more likely to get well. Bruce has suggested "right lower quadrant" actinomycosis as being a more appropriate designation than cecal actinomycosis.

This tendency for the site of origin of the disease to heal completely is a well-known fact in the facial and cervical types of the disease. The patient usually contracts actinomycosis by chewing grain or grasses; the organism, *Actinomyces bovis,* lodges about the teeth, and when the diagnosis is apparent no trace of the disease can usually be seen within the mouth.

Recently a patient with an abscess of the tongue presented himself for examination at the University Hospital. It was first believed that this was an abscess of the unobliterated upper portion of the thyroglossal duct tract. Most primary abscesses of the tongue, however, are due to actinomycosis and when search was made for the organisms they were readily demonstrated.

The results of treatment of actinomycosis on the whole are unsatisfactory, due largely to the fact that most cases present themselves late for treatment. Sporotrichosis is the only fungus infection in which iodine is a specific. The actinomyces may grow in a solution of potassium iodid. Iodine given in large doses, however, appears to be of definite value. Good results in the cervico-facial type have been obtained with deep *x*-ray and radium treatment. In the early case, however, curettement or surgical excision appear to be measures of greater value. The local use of copper sulphate, as suggested by Dr. Bevan in the treatment of blastomycosis, is of no value.

Dr. E. A. Regnier recalled a case of abdominal actinomycosis in a woman whom he operated upon three years ago. The case was that of an appendiceal abscess, which was drained. The abdominal wound healed in three weeks. The patient returned three weeks later with high fever, and pain in the upper right quadrant. At this time a subphrenic abscess was drained by a two-stage operation. A large quantity of serosanguinous pus was removed. On the third day sulphur granules were recovered from the wound. The singular finding in this case was that the appendix, which was about one inch in diameter, was sectioned serially, and no signs of actinomycosis were found. Dr. Regnier said he had looked up the literature at that time and most writers were of the opinion that the disease was spread by contiguous infection. In his

own case, the first manifestation was the subphrenic abscess, which speaks for infection through the lymphatics. The infection never appeared in the abdominal wall, but multiple sinuses appeared in the dorso-lumbar region. In looking up the subject of therapy, he found that almost everything had been used. In Dr. Regnier's case, massive doses of deep *x*-ray, and potassium iodide by mouth, had been used but therapy had no effect on the progress of the disease.

Dr. A. T. Mann stated that he had seen two such cases and in both of them the discharge contained a fair number of these bodies; in fact the sulphur granules could be seen with the naked eye quite readily.

In regard to the character of the growth and the pathology, Dr. Mann stated that it is the result of an irritation of the tissues, a granuloma in its growth. There is more or less destruction of the cells immediately about the infecting fungus, followed by attracted leukocytes and the proliferation of granulation tissue round about it. As a rule it is very slow to produce pus. The streptothrix does produce pus at times and some of the granuloma breaks down, but a good many of the suppurations come from secondary infection in the area of these granulomata. One might be misled in making an early diagnosis because of the firmness of the enlargement, and think the case possibly a sarcoma.

As to the spread of infection, secondary infection, and so on, Dr. Mann said that it is most like a septic pyemia or like sarcoma in its secondaries. The granulations grow into the veins and produce a secondary involvement from small emboli mostly, just as the secondary infection from pyemia and from sarcoma.

Dr. Mann said that what had been stated tonight in regard to treatment he had found to be true when he was reading the literature on this subject. Many things had been tried, but potassium iodide seems to be considered more favorably than any other one thing. And while it is true, as Dr. Wangensteen stated, that the streptothrix will grow in a solution of 1 to 2 per cent potassium iodid, that is not all there is to medication. It may also do something toward stimulating the surrounding tissues or other groups of tissues, with resulting destruction of the stroptothrix.

Dr. Mann also called attention to the fact that although most of these infections are supposed to get in with some food, about 20 per cent of the cases are found in people who have cavities in the teeth and the streptothrix has been found in the teeth; in fact it is sometimes found in the teeth cavities when the actinomycosis is not active in the patient.

Another interesting feature is the number of cases of infection of the lungs, with symptoms simulating tuberculosis of the lungs, and in which the resulting deaths have been credited to tuberculosis.

Dr. Yoerg, in closing, stated that in Sanford's collection the larger percentage of cases were found in the upper Mississippi Valley. Various treatments had been tried; some had used salvarsan, and some had given yeast. This was the first abdominal case Dr. Yoerg had seen and it occurred to him that opening up the abdominal wall, curetting the sinuses and packing them would yield the best results. He thought the trouble lay deeper; that it was intra-abdominal and probably involved the veins of the hip and thigh.

Dr. R. C. Webb and Dr. E. R. Anderson reported a case of Abscess of the Liver Complicating Acute Appendicitis.

Dr. Webb presented the patient, a fifteen year old boy, on whom he had operated for ruptured appendix one year ago. He called attention to the scar of the appendicitis operation and stated that the drainage used was the Gibson tampon described by him before this Society in 1923. No sutures were used in the wound. Three weeks later it was necessary to make an upper right rectus incision and drain a liver abscess. He asked the members to notice the absence of hernia in the lower scar even though it was a very large wound without sutures. In the first operation it was the usual serious ruptured appendix case. Dr. Webb asked Dr. Anderson to read the case report and review of the literature. (The case to be published as a separate paper in Minnesota Medicine.)

DISCUSSION

Dr. J. A. Johnson said the doctors should be congratulated in having secured this boy's recovery. He had seen four cases of liver abscess secondary to appendicitis. They all died. In every one of them the liver was filled with miliary abscesses, some of which had broken down into larger abscesses. Dr. Johnson said he could not see how this type of liver infection could recover. This led him to believe that one should undoubtedly consider two types of liver abscess, *i. e.*, the miliary type with diffuse abscesses, which undoubtedly does not recover; and the other, perhaps the occasional one, with a single abscess, which does recover. He believes that surgery should be resorted to in these cases because without it the outcome is usually hopeless.

One point Dr. Johnson wished to stress in regard to aspirating liver abscess. Many years ago he was present at a postmortem in which the man had had a liver abscess aspirated. The pus was very thick and did not flow through the needle and several attempts had been made in different parts of the liver to find the abscess. At postmortem every place the needle had been inserted a new culture had been implanted and there was an abscess from each needle insertion. Since that time he had always been very careful, using very large needles, and always changing the needle each time a puncture is made in a different location.

Dr. W. P. Herbst, in discussing the matter of drainage of liver abscess, thought that the method of sewing the liver to the abdominal wall was probably one of the main factors in the recovery of the patient. He stated that some men, in draining liver infections, would sew the area around the abscess to the peritoneum of the abdominal wall, leaving the wound open and later opening the abscess when the infected area was walled off from the peritoneal cavity. Where the anatomical relationships do not allow this sort of procedure, the next best thing is to use large amounts of

iodoform gauze to form a walled-off area in the region of the abscess to prevent abdominal infection. The method is one of walling off the abdominal cavity.

Dr. Theodore Sweetser called particular attention to the importance of chills in raising the suspicion of possible liver abscesses. He also called attention to the good fortune in Dr. Webb's case, in that there was no infection of the portal vein system. In entering the liver, the infection evidently did so without a purulent infection of the veins, which of course would have made the case almost hopeless.

Dr. Leo Murphy thought it would be interesting to know whether the cases reported are based on single or multiple abscesses of the liver. He felt that Dr. Johnson's point was very pertinent as far as liver abscess is concerned.

Dr. Martin Nordland said that it would be natural to question what the surgeon could do to prevent an abscess of the liver when operating upon a case of suppurative appendicitis. He advised applying the ligature to the meso-appendix as far away from the appendix as possible, as suggested by Dr. Jackson. This would exclude the thrombi in the small veins.

Dr. Theodore Sweetser suggested, as a measure for the prevention of such disasters, that the meso-appendix be carefully observed in order to discover thrombosis of any veins, ligating beyond any thrombus found.

Dr. Wangensteen felt that the point raised by Dr. Sweetser with reference to the occurrence of chills in acute appendicitis was very significant. While a junior house officer at the Colonial Hospital in Rochester he recalled seeing a patient who gave this history early in the course of the disease. No special note was made of the chills by the surgeon in attendance. At operation a diffuse suppurative process without peritoneal extension was found. In the course of the disease, chills continued and the patient died. At autopsy a pylephlebitis and multiple abscesses in the liver were found.

The occurrence of chills is synonymous with the presence of bacteria in the blood stream and in acute appendicitis it signifies thrombosis of the mesenteriolum of the appendix. Professor Melchior of Breslau has performed a successful secondary operation when chills occurred in the immediate convalescence after appendectomy, ligating and excising the mesenteriolum of the appendix high in the ileocecal angle. Melchior states that about eight successful secondary operations of this nature are to be found in the literature.

Dr. Mann said he wished to call attention to one point in regard to statistics showing the high percentage of liver abscess after appendicitis operations in the old reports. He said that in those days cases of appendicitis did not usually get into the hospitals unless they had an abscess and almost every operation in those early days was a pus appendix. He believed if the later statistics could be revised, taking only the abscess cases, one might get figures nearer the older statistics. He felt that the real point in the mortality of these cases lay in the fact that there is an accompanying septicemia or there are multiple abscesses. He was of the opinion that if several abscesses were close together and they could be broken down with the finger into one cavity and drained they might recover, but if there were multiple abscesses and some were not drained they are more likely to be fatal.

Dr. Webb, in closing, thanked the members for their generous discussion of the case. The boy had presented the usual appearance of a case of appendicitis, such as all the members had seen, and was one which was apparently going to die. The operation was performed as a rather extreme measure in this case, but Dr. Webb felt that, after seeing this boy and hearing the discussions of the case, the members would all have more courage to operate upon and drain these liver abscess cases earlier and more frequently than they had before.

Dr. Anderson, in closing, discussed some of the things which might be done to prevent liver abscess and stated that Wilms resected the veins that were thrombosed in the ileocecal angle and had cases of recovery. Braun ligated the ileocolic vein and has reported successful cases. Colp of New York experimented with gradual ligation of the portal vein in dogs and they lived. He tried the same procedure on three patients who had an extreme grade of thrombopylephlebitis and had been unsuccessful in obtaining recoveries. This was discussed to a greater extent in the paper under the section on treatment, the reading of which was omitted on account of the time limit.

Dr. Oswald S. Wyatt read his Thesis entitled "Congenital Hypertrophic Pyloric Stenosis." (To be published at a later date in Minnesota Medicine.)

DISCUSSION

Dr. Willard White stated that he had enjoyed this paper very much and there were two or three points he wanted to mention. He called attention to Dr. Wyatt's method of making an incision through the hypertrophied muscle and then continuing by spreading with forceps, but Dr. White felt that using the blunt end of the scalpel furnished a safe way to accomplish this and avoided opening the mucous membrane. He believed it advisable to close the abdominal wound with mattress sutures tied through buttons, especially if the infant was in poor condition and one wished to save time. He felt that the use of buttons was a very great advantage as the sutures would hold securely and there was very much less cutting of the skin by the sutures.

Dr. White felt that the conservation of heat during the time of operation is also an important factor, and the infant should not only be wrapped in cotton batting but the batting should previously be warmed in some kind of warming device and, in addition, hot water bottles should be kept around the infant during the time of operation.

Dr. White was of the opinion that there is very much less objection to general anesthesia in these operations than is often thought. One hears much emphasis placed on local anesthesia, and that is all right, but one's strategy is very important in these cases and un-

less the operator is very careful in the use of local he may cause pain and resulting shock; and in the avoidance of shock, Dr. White felt that general anesthetic is preferable.

Dr. Green asked Dr. Wyatt what he thought of the Strauss method of technic in the cases where a muscle flap is used to cover over the mucous membrane. Dr. Green said when he was in Chicago he heard Dr. Strauss discuss his operation at some length and also saw him do an operation. It seemed to Dr. Green that the benefit derived was hardly worth the extra time and trouble as compared to the Rammstedt operation, and he would like to have Dr. Wyatt's opinion about it.

Dr. Theodore Sweetser brought up a point which had been stressed by Dr. R. E. Farr in discussing this subject some years ago and which also had been called very strongly to his own attention in a case he happened later to see in one of the hospitals. In the latter case the baby was given ether anesthesia before the surgeon and his assistant were ready to operate, so that the baby was exposed to the anesthetic an unnecessarily long period of time. That might have been avoided under local anesthesia. If the operation is to be done under general anesthesia, everything in the operating room should be so arranged as to avoid unnecessary delay after the child is put to sleep.

Dr. Wyatt, in closing, said that he was familiar with the Strauss method of operation as mentioned by Dr. Green, but that he had never used it himself as he had had such very good results with the Rammstedt operation that he had not tried any other. In reading up on the Strauss operation, Dr. Wyatt was under the impression that it would take a little more time and he had not thought it advisable to use it.

The meeting adjourned.

H. O. McPheeters, M.D., *Secretary.*

CONSULTATION BUREAU

(Continued from Page 918)

can suggest as to treatment will be appreciated. There are several ulcers now with punctuate cloudy spots in the cornea. Eye still red and congested, painful to the extent of interfering with sleep. Reported less painful today.

Answer.—1. From the description one would gather that the injection of the eye is secondary to the ulceration of the cornea. If this is the case the line of treatment is quite different than it would be had the ulcer resulted as a complication of the conjunctivitis. In primary marginal ulcers of the cornea one can usually trace the cause to a focus of infection somewhere in the system. It may also be due to conditions such as diabetes. Ulcers of this type are slow in healing and recurrences are frequent. The treatment usually prescribed is removal of the focus and putting the patient in the best physical condition possible. If pus is absent, put the eye at rest by keeping the lid closed. The movement of the lid tends to aggravate the condition. Bichloride ointment 1-5,000 should be applied twice daily. If, after a few days, improvement does not take place, the eye should be anesthetized with butyn and each ulcer touched with absolute alcohol, care being taken not to touch normal corneal tissue. Atropine should be used. Warm applications may be made to the eye for fifteen minutes three times a day. Dark glass over the good eye will lessen the photophobia. If the above measures do not cause healing, the thermaphore should be used. Some cases respond well to foreign protein injections, such as 5 c.c. of boiled milk. If the ulcer is secondary to the conjunctival inflammation, foreign protein therapy is advisable. The eye should be irrigated frequently with warm metaphen solution 1-5,000. The patient should be put at rest. The ulcers touched with absolute alcohol if healing does not take place. Silver nitrate 2% applied to the lids following an application of butyn is beneficial.

2. It would appear from the history of this case that the patient has a probably mycotic ulcer of the cornea. These mycotic infections are usually due to aspergillus, coming from organic foreign bodies, particularly grain. Extensive examination by smears would be advisable. The condition of the conjunctiva of the lids is not mentioned. Here, too, is a possibility of irritation of the cornea, secondary to lid involvement. If the ulcer continues to resist treatment, as outlined, I would suggest trying cautery with phenol or tincture of iodine, or the possibility of putting a Kundt flap of conjunctival over the ulcerated area.

THE ADVERTISING OF THE DENTIFRICE

The early part of the twentieth century may be interesting historically for the fact that it witnessed the apotheosis of the tooth brush, the tooth paste and the mouth wash. So far as mouth washes are concerned, their virtues may lie in a slight astringency or alkalinity, in the mildly antiseptic influence they exert for a brief period, or more probably in the fact that they contain enough water to provide a lavage appealing to the organoleptic senses. "Halitosis" gave to Listerine a sales impulse that no other mouth wash has ever been able to equal. The fact that the combination of substances included in Listerine is relatively ineffective and will not cure halitosis did not lessen the sales impulse. Recently, the Food and Drug Administration has cast a critical eye over the claims for antiseptic value made for various mouth washes and gargles. It is currently reported that the owners of all these bringers of gold are rushing hither and thither to the laboratories searching for substances that really are antiseptics and that can be added to their concoctions without changing taste or color—the important qualities—that the claims may be justified. Recently, dentifrices have been widely exploited with various claims. A half dozen assorted chemists and the commissioner of health of New York assert that low surface tension means that a tooth paste will penetrate better between the teeth. The claim of special value because of low surface tension in connection with the selling of any tooth paste is one hundred per cent hokum. Any mixture of soap, glycerin and chalk, such as is available in many tooth pastes, would be equally endowed with a low surface tension. The council on dental therapeutics of the American Dental Association is now making efforts to secure restriction of the claims for dentifrices and physicians should do all that they can to aid the American Dental Association in this campaign. (Jour. A. M. A., October 25, 1930, p. 1267.)

PROGRESS

Abstracts to be submitted to Section Supervisors.

Members are urged to abstract valuable articles which they run across in their reading and send the abstracts to the physicians in charge of the respective sections. In order to avoid duplication it would be well to communicate with one of the section supervisors before the article is abstracted.

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EYE, EAR, NOSE AND THROAT

THE FREQUENCY OF MASTOIDITIS IN INFANTS: T. C. Helwig and O. J. Dixon, M.D. (Arch. of Otolaryng., Feb., 1930, p. 1). Much controversy has arisen regarding the relationship between mastoiditis and acute nutritional disturbances in infants. The contention of most investigators has been that the ear infection acted as the primary focus and that the enteric disturbance was secondary. The result has been a marked increase in the number of ear drums lanced and mastoids operated on.

The authors were struck by the fact that in a series of 173 necropsies on patients from both the pedriatric and the otologic services, they encountered fifty-seven cases in which changes were present either in the middle ear or in the mastoid or in both.

A careful study of these 57 cases (or 32.8%) was made in an effort to determine the relationship of mastoiditis to enteritis.

Only seventeen of these fifty-seven cases showed evidence of enteric infection, while the remaining forty represented almost every common disease of infancy. The case reports show the incidence of ear and mastoid infection to be much higher in the non-enteric than in the enteric group. A careful study shows that the histologic observations fit in rather accurately with the clinical findings, and in every case the history of diarrhea antedated the ear infection.

(1) In the usual fatal illnesses of infants ear infection is a common terminal event. (2) Enteritis, as shown by necropsy, too frequently antedates the ear infection for one to assume that the latter is primary. (3) The mortality rate of these infants coming to operation has been high and distinctly out of proportion to the usual mortality rate. From this study, one concludes that although surgical mastoiditis does occur in infants, its importance has been vastly overrated.

GERALD M. KOEPCKE, M.D.

PEDIATRICS

PRACTICAL VALUE OF IMMUNIZATION AGAINST SCARLET FEVER WITH STREPTOCOCCUS TOXIN: T. Toyoda, J. Moriwaka, Y. Futagi and M. Okamoto. (Jour. Infect. Diseases, 46-219, March, 1930). The authors found after immunization with up to 40,000 skin test doses of the Dick toxin that over fifteen per cent of the individuals remained Dick-positive. These positive reactions were ascribed to production of allergy to the heat-stable component of the Dick toxin. On retesting this positive group with heat-labile toxin, which they consider to indicate actual immunity, these positive reactions were found to be negative. By means of prophylactic immunization of 3,197 children with the Dick toxin the scarlet fever incidence was reduced to one forty-third the rate prevalent among the unimmunized. Cases of scarlet fever occurred in children after immunization but were generally mild. The authors feel, therefore, that immunization against scarlet fever by means of the Dick toxin is of value provided 30,000 or more skin test doses are administered to make the immunization thorough. Some difficulty was encountered in systemic reactions to the naked Dick toxin. These reactions were reduced through the use of toxin detoxified by treatment with 0.4 per cent formaldehyde according to the method used by Ramon for detoxifying diphtheria toxin. The scarlet fever anatoxin prepared by treating the Dick toxin with formaldehyde and heated to 48° C. has its toxicity sufficiently reduced to render possible the administration of large amounts of the toxin without causing reactions. Anatoxin prepared in this manner, however, loses some of its effectiveness in rendering the individual immune as indicated by skin test, due possibly to a reduction in its antigenic power from the high temperature at which the anatoxin is prepared.

C. A. STEWART, M.D.

BOOK REVIEWS

Books listed here become the property of the Ramsey and Hennepin County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of interest to physicians.

PRIMER ON FRACTURES. Price $I. Chicago, American Medical Association, 1930.

The increased interest shown in fractures led in 1926 to the appointment of a committee consisting of Drs. Nathaniel Allison, William Darrach and Kellogg Speed by the Surgical Section of the A. M. A. to prepare an exhibit of accepted methods for treating the various common fractures for inclusion in the scientific exhibit at the annual A. M. A. meetings. This exhibit, which has been offered at the last four annual meetings excited such interest that the material presented has been put in book form and published by the A. M. A. at a very reasonable price. The book is well illustrated, brief and worth much more than the price would indicate.

OSLER'S PRINCIPLES AND PRACTICES OF MEDICINE. Revised by T. McCrae. 11th Edition. Price $8.50. New York and London: Appleton and Co., 1930.

This latest edition continues to hold the place of its predecessors as the best one-volume work on the subject. Exteriorly its appearance is the same as the earlier editions, but the contents show the results of a painstaking revision, which brings all the sections thoroughly up to date. One of the most valuable assets of the volume is the index, which has been prepared with unusual care and thoroughness.

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INDEX TO VOLUME XIII

A

Abbott, A. Clifford, and Ryan, George: Corbus' Disease, 315
Abdomen, infant, Surgery of the, 826
Abortion, incomplete, A plea for the radical treatment of, 310
Acriflavine, The treatment of psorasis vulgaris with intravenons administration of, 818
Actinomycosis of the mediastinum (case report), 716
Acute perforated peptic ulcer, 465
Adenomatons polyps of the colon and rectum, 229
Advancing knowledge of spinal anesthesia, The, 1
Affections of the round ligament with report of a case of double tuberculous hydrocele, 247
Alberts, Max W.: Hyperthyroidism in children, 175
Allen, Philip K., and Sweitzer, Samuel E.: The treatment of psoriasis vulgaris with intravenous administration of acriflavine, 818
Amputation, Circulatory tests previous to, 896
An analysis of 100 consecutive cases of back strain, 572
Anderson, Arnold S.: First infection by the tubercle bacillus, 540
Anderson, Edward Dyer: Gastrointestinal symptoms occurring with upper respiratory infections in infancy and childhood, 103
Anderson, Karl W.: Carcinoma of the stomach, 643
Anderson, Karl W.: Hyperleukocytosis in diabetic coma, 31
Anderson, Karl W.: Pernicious anemia in the young, 297
Anemia, Pernicious: an historical summary with especial reference to the occurrence of fever, 379
Anemia, pernicious, Further observations on the treatment of, with gastric tissue of swine, 865
Anemia, Pernicious, in the young, 297
Anemia, pernicious, The effect of liver and liver extract upon the symptoms and signs referable to the nervous system in, 815
Anesthesia, eye, ear, nose and throat, 686
Anethesia, general, Pulmonary complications of, 694
Anethesia, local, 691
Anethesia, local, The anesthesia problem as related to, 688
Anesthesia problem as related to local anesthesia, The, 688
Anesthesia, Spinal, 4
Anesthesia, Spinal: Conclusions based on a study of 1,283 cases, 682
Anesthesia, spinal, The advancing knowledge of, 1
Anesthesia, spinal, The physiology of, 183
Anesthesia, Spinal, with reduced dosage of spinocain, 855
Anesthetics, The use of barbituric acids, acetylene, spinal anesthesia, tribromethyl alcohol and other, in the Mayo clinic in 1929, 223
Aneurysm, Popliteal (case report), 45
Anomalous extra-vesical origin of ureter, An, 158
Aortic valve, The clinical aspects of sclerotic changes in the, 628
Appendicitis, acute, Differentiation between, and acute prostatitis and seminal vesiculitis. Report of two cases (case report), 252
Arthritis, chronic, A synopsis of the treatment of, 708
Asbestosis, Pulmonary (case report), 495

Abstracts

Abscess of the brain from the standpoint of the ophthalmologist, 728
Acute edema of the pancreas, 135
Acute obstructive laryngitis, 849
Acute purulent meningitis of aural origin, 277
Appendicitis following tonsillectomy, 847
Asthma in children, 593
Atrophic and vasomotor rhinitis, 593
Beriberi in late infancy: the result of celiac disease, 271
Bismuth therapy exclusively in congenital syphilis, 274
Brain abscess from the standpoint of the otolaryngologist, 847
Breast feeding, 272
Bronchial obstruction—its relation to atelectasis, broncho-pneumonia and lobar pneumonia, 276
Bronchiectasis, an unappreciated cause of chonic bronchitis, 594
Carcinoma of the colon—intraperitoneal vaccination by mixed vaccine of colon bacilli and streptococci, 271
Child's heart in health and disease, The, 849
Chorea: its genesis and its classifications, 274
Clinical syndrome of hyperparathyroidism, The, 512
Clinical trial of uroselectan, 443
Danger signals in new-born infants, 272
Diagnostic value of sodium fluorescein in epidemic cerebrospinal meningitis, 849
Early rheumatic infections in childhood, 207
Epituberculosis, 440
Ergotismus gangrenosus, 848
Extemporaneous evacuation of the uterus under spinal anesthesia, 848
Factors of error in the roentgenologic diagnosis of diseases of the colon, 513
Frequency of mastoiditis in infants, The, 929
Further contribution on celiac disease, A, 273
Further experiences with roentgen therapy in psychiatric and neurological diseases, 595
Further report of the treatment of whooping cough by intramuscular injections of ether, 272
Idiopathic anemia of the newborn infant, 514
Indications for thoracoplasty, 205
Infraclavicular foci of infiltration as evidence of incipient tuberculosis of the lungs in young adults, 206
Interpretation of roentgenograms of chest in children based on observations of necropsy, 275
Mastoiditis with gastrointestinal disturbances in infants, 442
Mucous and umbilical colic in children, 274
Multiple intercostal neurectomy for pulmonary tuberculosis, 133
Nutrition of healthy and sick infants and children, 271
Observations on the etiological correspondence between anginal pain and cardiac infarction, 592
Ovarian transplantation, 134
Pathology of so-called "acute pyelitis" in infants, 63
Phenylethylhydantoin in the treatment of Sydenham's chorea, 592
Physiological mechanism of pneumothorax, The, 205
Place of the hospital in the promotion of public health programs, 134
Poliomyelitis, 848
Practical value of immunization against scarlet fever with streptococcus toxin, 929
Present status of hysterosalpingography, 275
Primary carcinoma of the ureter—report of a case and a review of the literature, 269
Radiology of the thorax, 206
Radiology of thorax, 64
Recurrent hemorrhages into the retina and vitreous—calcium deficiency as a possible cause, 677
Relative prophylactic value of convalescent and immune adult measles serums, 676
Reliability of guinea pig inoculations in the diagnosis of tuberculosis, 440
Relief of nasal obstruction in children due to deviation of the septum, 441
Removal of lead shot from the vitreous, 677
Roentgen diagnosis of lesions of the jejunum and ileum, 275

Roentgenography of the kidneys and urinary tract by means of intravenous injection of a new contrast medium, uroslectan, 442
Roentgenologic manifestations of intracranial disease, The, 206
Roentgen studies on the appearance of spinal tuberculosis in an early stage, 513
Sinus in perspective, The, 846
Sinusitis and tuberculosis in children, 273
Some non-surgical aids in the treatment of glaucoma, 676
Some points in the treatment of meningitis, 277
Stenosis of the nasopharynx, 135
Study of roentgen therapy in mental and nervous diseases of childhood, 595
Sub-maxillary fossa approach to deep pus in the neck, 594
Temporary diversion of the urine by pyelostomy in repair of the ureter, 270
Test of labor, A, 848
Tonsils and some experiences of their surgical treatment, The, 276
Treatment of infantile eczema, 729
Tuberculosis in infancy and childhood, 441
Tuberculosis in infants under one year of age—a study of the autopsy and the clinical observations on infants with tuberculous lesions, 63
Tuberculosis in public school children, 268
Use of gelatin as a supplementary food in the infant's dietary, 514
Use of phenobarbital in infant feeding, The, 729

B

Back strain, An analysis of 100 consecutive cases of, 572
Baker, B. M., Jr., Bordley, James, III, and Longcope, W. T.: The effect of liver and liver extract upon the symptoms and signs referable to the nervous system in pernicious anemia, 815
Ball, Charles R.: Some observations on the etiology of tic douloureux with the clinical reports of a new method of treatment, 556
Barbituric acid, The use of several new derivatives of, 679
Bargen, J. Arnold: Mutation of streptococci: report of a probable case, 99
Bargen, J. Arnold: Tuberculosis of the intestine: its differential diagnosis, 457
Bargen, J. Arnold, and Rankin, Fred W.: Ulcerative colitis as a complication of abdominal operations, 375
Bayley, E. C.: Undulant fever, 713
Benedict, William L.: The significance of temporary blindness, 891
Bessesen, Daniel H.: The advancing knowledge of spinal anesthesia, 1
Bessesen, Daniel H.: Vaginal sterilization, 318
Bladder, kidneys, prostate gland and testes, Malignant lesions of the, 808
Blindness, temporary, The significance of, 891
Blood smears, The practical value of examination of, 860
Boils and carbuncles, The treatment of, by roentgen rays, 554
Bone, pisiform, Comminuted fracture of the (case report), 118
Bordley, James, III, Baker, B. M., Jr., and Longcope, W. T.: The effect of liver and liver extract upon the symptoms and signs referable to the nervous system in pernicious anemia, 815
Borg, Joseph F.: Experiences in the use of the sulphocyanates, 293
Bovine thymus, The, 17
Bovine tuberculosis, Incidence of, in humans, and report of the official control and elimination of bovine tuberculosis in Minnesota, 393
Boyer, S. H.: Jaundice problems, 169
Boyer, S. H., President Minnesota State Medical Association, 1930, Photograph, 46
Boyer, S. H.: President's address, 599
Boyer, S. H.: Relation of physical findings to lung pathology, 80
Braasch, William F.: Symptoms and complications of chronic urinary obstruction, 154
Brain surgery, Three cases of, 517
Breast, The early diagnosis and treatment of malignancy of the, 803
Briggs, John Francis, and Pedersen, Arthur H.: Comminuted fracture of the pisiform bone (case report), 118
Bronchi and lungs, Primary carcinoma of the, 605
Burns, H. T.: The management of tuberculosis. (Part I), 28
Burns, H. T.: The management of tuberculosis. (Part II), 85
Burns, of children, The use of tannic acid in, 775

Book Reviews

Annual reprint of the reports of the council on pharmacy and chemistry of the American Medical Association for 1929, 598
Böhler, Lorenz: The treatment of fractures, 208
Cherry, Thomas H.: Surgical and medical gyneclogical technic, 597
Christian, W. G., and Haskell, Charles C.: Physiology for nurses, 444
Fulton, John Farquhar: Selected Readings in the History of Physiology, 853
Haden, Russell Landram: Clinical laboratory methods, 678
Livermore, George Robertson: Gonorrhea and kindred infections, 348
Marriott, William McKim: Infant nutrition, 515
Meagher, John F. W.: A study of masturbation and the psychosexual life, 136
Myers, J. Arthur: Tuberculosis among children, 597
New and non-official remedies, 598
Norris, Charles C.: Uterine tumors, 515
Osler's principles and practices of medicine, revised by T. McCrae, 930
Outline of preventive medicine, New York Academy of Medicine, 207
Pruitt, Marrion C.: Injection treatment of internal hemorrhoids, 443
Primer on fractures, American Medical Association, 930
Quigley, Daniel Thomas: The conquest of cancer by radium and other methods, 136
Ringer, Paul H.: Clinical medicine, 597
Simpson, Walter M.: Tularemia, 207

C

Campbell, Orwood J.: The early diagnosis and treatment of malignancy of the breast, 803
Cancer of the uterus, The early diagnosis of, 793
Carbuncle of the kidney, 484
Carbuncles and boils, The treatment of, by roentgen rays, 554
Carcinoma, inoperable, A report of four cases of, treated with intramuscular injections of karkinolysin, 65
Carcinoma of the cervix of the uterus, Distant metastasis in, 489
Carcinoma of the stomach, 643
Carcinoma of the stomach, The early diagnosis of, 784
Carcinoma, Primary, of the lungs and bronchi, 605
Careful obstetrics, 41
Carey, James B.: A case of myxedema and diabetes (case report), 578
Case of myxedema and diabetes, A (case report), 578
Case of tetany and edema in the newborn, A, 476

Cervix of the uterus, Distant metastasis in carcinoma of the, 489
Cesarean section, Sodium amytal in (case report), 328
Chest, diseases of the, Iodized oil for, 22
Childhood type of tuberculosis, The, 613
Child, tuberculous, The, 74
Christopher, Frederick: Minor surgery, 451
Cinchophen, Poisoning from (case report), 327
Circulatory tests previous to amputation, 896
Clement, Gage, and Collins, Arthur N.: Ureteral stone with periureteral extravasation (case report), 910
Clinical aspects of sclerotic changes in the aortic valve, The, 628
Cole, Wallace H.: Leg lengthening for shortening due to infantile paralysis (case report), 904
Colitis, Ulcerative, as a complication of abdominal operations, 375
Collins, Arthur N.: Tibial fractures into the knee joint, 285
Collins, Arthur N., and Clement, Gage: Ureteral stone with periureteral extravasation (case report), 910
Colon and rectum, Adenomatous polyps of the, 229
Colon, The diagnosis of malignant conditions of, 796
Comminuted fracture of the pisiform bone (case report), 118
Committee on Public Health Education: 54, 124, 196, 260, 334, 420, 504, 586, 660, 726, 838, 916
Congenital syphilis, 302
Congenital valvular obstruction of the posterior urethra (case report), 412
Conner, H. Milton: Further observations on the treatment of pernicious anemia with gastric tissue of swine, 865
Consultation Bureau: 56, 128, 200, 262, 338, 424, 510, 588, 662, 724, 834, 918
Coöperation of the dentist with the surgeon in a general physical examination, 88
Corbus' Disease, 315
Coronary occlusion with survival, 163
Cotton, Charles E: Incidence of bovine tuberculosis in humans, and report of the official control and elimination of bovine tuberculosis in Minnesota, 393
Coventry, W. A., and Moe, R. J.: The early diagnosis of cancer of the uterus, 793
Cranial nerves, Palsy of the, 880

COMMUNICATIONS

Bauer, L. H., Medical Director, Department of Commerce, Aeronautics Branch, Washington, 127
Burns, William J., Executive Secretary, Academy of Medicine, Toledo, Ohio, 49
Cramp, Arthur J., American Medical Association, 333

D

Davidson, Edward C.: The use of tannic acid in burns of children, 775
Dean, Arthur C.: Ulcus rodens of right eye treated by a conjunctival flap operation (case report), 44
Dentist, Coöperation of the, with the surgeon in a general physical examination, 88
Diabetes and myxedema, A case of (case report), 578
Diabetic coma, Hyperleukocytosis in, 31
Diagnosis and treatment of abnormal uterine bleeding, The, 172
Diagnois of malignant conditions of the colon, The, 796
Differentiation between acute appendicitis and acute prostatitis and seminal vesiculitis. Report of two cases (case report), 252
Distant metatasis in carcinoma of the cervix of the uterus, 489
Dixon, Claude F., and Lundy, John S.: The use of several new derivatives of barbituric acid, 679
Donohue, Philip F.: Stone in the upper urinary tract: its clinical manifestations and treatment, 636
Drake, Carl B.: The clinical aspects of sclerotic changes in the aortic value, 628

E

Early diagnosis and treatment of malignancy of the breast, The, 803
Early diagnosis and treatment of malignant conditions of the mouth and lips, 788
Early diagnosis of cancer of the uterus, The, 793
Early diagnosis of carcinoma of the stomach, The, 784
Early or late operative treatment in complications of acute otitis media, 238
Edema and tetany, A case of, in the newborn, 476
Effect of liver and liver extract upon the symptoms and signs referable to the nervous system in pernicious anemia, The, 815
Encephalitis, 888
Encephalitis, Meningo—a complication of epidemic parotitis, 107
Endocrinology, Some recent advances in, 8
Epidemic parotitis, Meningo-encephalitis—a complication of, 107
Epilepsy, reactive, Psychoanalysis in, 180
Essential hypertension—particularly stressing the significance of diastolic blood pressure, 369
Evans, James A.: Coronary occlusion with survival, 163
Evulsion of the phrenic nerve for pulmonary tuberculosis, 545
Exley, Erwin W., and Thomas, Gilbert J.: Carbuncle of the kidney, 484
Experiences in the use of the sulphocyanates, 293
Experience, medical, The teachings of, 219
Extra-uterine pregnancy: antecedent and subsequent histories in 471 cases, 822
Eye, ear, nose and throat anesthesia, 686
Eye, right, Ulcus rodens of, treated by a conjunctival flap operation (case report), 44
Eye, The industrial, 178

EDITORIAL

Annual meeting, The, 501
Anti-vivisection bill, The, 913
Apropos of medical costs, 194
Are the State dues excessive? 255
Associate editor, 258
Boehler's method of treatment of fractures, 657
Coöperation with the Purple Cross, 657
Doctor as a citizen, The, 502
Etiology of the common cold, 583
Fair play, 122
Food faddists, 833
Historical Committee, 48, 123, 914
Inter-State Postgraduate Medical Association, 721
"Jake" paralysis, 418
Karkinolysin and cancer, 121
Medical meetings, 658
Minnesota Medical School and the July kidney symposium, 417
Moments of rest, 722
More narcotic legislation, 193
Mortality prevention in mothers and infants, 121
Opinion concerning safety of spinal analgesia, 47
Physicians and advertising, 721
Poisoning from cinchophen, 331
Poliomyelitis in Minnesota, 832
Present morale in athletic training, The, 502
Preventive inoculation against disease, 584
Protecting children from tuberculosis, 257
Saving the taxpayers, 584
Schools for technicians, 256
Suggested crime, 48
Supreme Court of Minnesota upholds Basic Science Law, 831
Uroselectan, 418

Women's State Auxiliary, 914
Yale's Institute of Human Relations, 332

F

Farr, Robert Emmett: The anesthesia problem as related to local anesthesia, 688
Fever, Rheumatic: A communicable disease, 37
Fever, Undulant, 713
Figi, Frederick A.: Early diagnosis and treatment of malignant conditions of the mouth and lips, 788
Fink, Leo W., Status of tinted lenses, 632
Fink, Walter H.: The recognition of glaucoma by the general profession, 90
First infection by the tubercle bacillus, 540
Fistula, Pharyngo-esophageal mediastinal, reëntering the esophagus (case report), 413
Foley, Frederick E. B.: An anomalous extra-vesical origin of ureter, 158
Ford, Frances A.: Distant metastasis in carcinoma of the cervix of the uterus, 489
Ford, Frances A.: Treatment by roentgen rays in ovarian dysfunction, 186
Foreign bodies, intestinal (case report), 909
Fracture, Comminuted, of the pisiform bone (case report), 118
Fractures, The repair of, 137
Fractures, Tibial, into the knee joint, 285
Frost, Russell H.: The incidence of tuberculous infection in school children, 216
Further observations on the treatment of pernicious anemia with gastric tissue of swine, 865

G

Gastrointestinal symptoms occurring with upper respiratory infections in infancy and childhood, 103
Geer, Everett K.: Evulsion of the phrenic nerve for pulmonary tuberculosis, 545
Geer, Everett K.: Iodized oil for diseases of the chest, 22
Gillespie, M. G.: Postoperative hypothyroidism, 235
Gillespie, M. G., and Strobel, W. G.: The use of sodium chloride in the treatment of varicose veins, 34
Glaucoma, The recognition of, by the general profession, 90
Goeckerman, William H.: Recurrent lymphangitis, 902
Goeckerman, William H.: Tuberculids, 462
Goltz, E. V.: Primary carcinoma of the lungs and bronchi, 605
Gowan, L. R.: The use of sodium amylethyl barbiturates in nervous disorders, 874
Graves, W. N.: The pre-operative care of patients for prostatectomy, 402

H

Hanson, Adolph M.: A report of four cases of inoperable carcinoma treated with intramuscular injections of karkinolysin, 65
Hanson, Adolph M.: The bovine thymus, 17
Hartley, E. C.: The tetanoid syndrome in pregnancy, 190
Hathaway, J. C.: Rheumatic fever: a communicable disease, 37
Hayes, James M.: Modern treatment of varicose veins, 564
Head, George Douglas: The teachings of medical experience, 219
Heart disease, Valvular, in young adults, 624
Heck, Frank J., and Watkins, Charles H.: The practical value of examination of blood smears, 860
Hengstler, William H., and Ruhberg, George N.: Encephalitis, 888
Henry, Myron O.: An analysis of 100 consecutive cases of back strain, 572
Herbst, William P.: The differentiation between acute appendicitis and acute prostatitis and seminal vesiculitis. Report of two cases (case report), 252
Hernia, Retroperitoneal (case report), 580
Hochfilzer, John J.: Early or late operative treatment in complications of acute otitis media, 238
Hullsiek, Harold E.: Adenomatous polyps of the colon and rectum, 229
Hullsiek, Harold Edwin, Ambroise Paré—military surgeon, 648
Hullsiek, Richard B.: Congenital valvular obstruction of the posterior urethra (case report), 412
Humphrey, W. R., and Sherwood, K. K.: Pernicious anemia: an historical summary with especial reference to the occurrence of fever, 379
Hyperleukocytosis in diabetic coma, 31
Hypertension, Essential—particularly stressing the significance of diastolic blood pressure, 369
Hyperthyroidism: a review of 270 hospital records, 652
Hyperthyroidism in children, 175
Hypothyroidism, Manifestations of, in the limited fields of medical practice, 281
Hypothyroidism, Postoperative, 235
Hysteria in children, Ocular manifestations of, 618

I

Incidence of bovine tuberculosis in humans, and report of the official control and elimination of bovine tuberculosis in Minnesota, 393
Incidence of tuberculous infection in school children, The, 216
Industrial eye, The, 178
Infantile paralysis, Leg lengthening for shortening due to (case report), 904
Intestinal foreign bodies (case report), 909
Intestine, Tuberculosis of the: its differential diagnosis, 457
Intravenous administration of sodium iso-amylethyl barbiturate (sodium amytal) for the alleviation of pain during labor, The, 868
Iodized oil for diseases of the chest, 22

J

Jackson, Arnold: Spinal anesthesia: Conclusions based on a study of 1,283 cases, 682
Jaundice, obstructive, Some clinical features of, 699
Jaundice problems, 169
Johnson, Eugene F.: The childhood type of tuberculosis, 613
Jones, E. Mendelssohn: Affections of the round ligament with report of a case of double tuberculous hydrocele, 247
Jordan, Ferdinand M., and Snell, Albert M.: Some clinical features of obstructive jaundice, 699
Judd, E. Starr, and Moersch, Herman J.: Pharyngo-esophageal mediastinal fistula reëntering the esophagus (case report), 413

K

Karkinolysin, A report of four cases of inoperable carcinoma treated with intramuscular injections of, 65
Kidney, Carbuncle of the, 484
Kidneys, bladder, prostate gland and testes, Malignant lesions of the, 808
Knight, Ralph T.: Pulmonary complications of general anesthesia, 694

L

Labor, The intravenous administration of sodium iso-amylethyl barbiturate (sodium amytal) for the alleviation of pain during, 868
Labor, The rectal examination and the concealed second stage of, 110
Larson, W. W.: Coöperation of the dentist with the surgeon in a general physical examination, 88
La Vake, R. T.: The rectal examination and the concealed second stage of labor, 110

Leddy, Eugene T., and Morton, S. Archibald: The treatment of boils and carbuncles by roentgen rays, 554
Leg lengthening for shortening due to infantile paralysis (case report), 904
Lenses, tinted, Status of, 632
Lewis, W. W.: When is a hyperplastic sinus, and what? And its parallel—the mucoid ear, 322
Ligament, round, Affections of the, with report of a case of double tuberculous hydrocele, 247
Lillie, Harold I.: The problem of disease of the paranasal sinuses, 877
Lister, Lord, 445
Liver and liver extract, The effect of, upon the symptoms and signs referable to the nervous system in pernicious anemia, 815
Local anesthesia, 691
Logefeil, Rudolph C.: Actinomycosis of the mediastinum (case report), 716
Longcope, W. T., Baker, B. M., Jr., and Bordley, James, III: The effect of liver and liver extract upon the symptoms and signs referable to the nervous system in pernicious anemia, 815
Lord Lister, 445
Lundy, John S.: The use of barbituric acids, acetylene, spinal anesthesia, tribromethyl alcohol and other anesthetics in the Mayo Clinic in 1929, 223
Lundy, John S., and Dixon, Claude F.: The use of several new derivatives of barbituric acid, 679
Lung pathology, Relation of physical findings to, 80
Lungs and bronchi, Primary carcinoma of the, 605
Lymphangitis, Recurrent, 902

Mc

McCloud, C. N.: Essential hypertension—particularly stressing the significance of diastolic blood pressure, 369
McDonald, Archibald L.: The diagnosis and treatment of abnormal uterine bleeding, 172
McKinlay, C. A.: Manifestations of hypothyroidism in the limited fields of medical practice, 281
McKinlay, C. A.: Valvular heart disease in young adults, 624
McLane, Evelyn Gruhlke: Hyperthyroidism: a review of 270 hospital records, 652

M

Malaria and anopheline mosquitoes in Minnesota, 410
Malignancy of the breast, The early diagnosis and treatment of, 803
Malignant conditions of the colon, The diagnosis of, 796
Malignant conditions of the mouth and lips, Early diagnosis and treatment of, 788
Malignant lesions of the kidneys, bladder, prostrate gland and testes, 808
Management of tuberculosis, The (Part I), 28
Management of tuberculosis, The (Part II), 85
Manifestations of hypothyroidism in the limited fields of medical practice, 281
Masson, James C.: Extra-uterine pregnancy: Antecedent and subsequent histories in 471 cases, 822
Maxeiner, Stanley R.: Local anesthesia, 691
Mediastinum, Actinomycosis of the (case report), 716
Meningo-encephalitis—a complication of epidemic parotitis, 107
Metastasis, Distant, in carcinoma of the cervix of the uterus, 489
Mills, Ralph G.: Pulmonary asbestosis (case report), 495
Minor surgery, 451
Modern treatment of varicose veins, 564
Moe, Russell J.: The physiology of spinal anesthesia, 183
Moe, R. J., and Coventry, W. A.: The early diagnosis of cancer of the uterus, 793
Moersch, Herman J., and Judd, E. Starr: Pharyngo-esophageal mediastinal fistula reëntering the esophagus (case report), 413
Morsman, L. W., and Sinamark, Andrew: Eye, ear, nose and throat anesthesia, 686
Morton, Howard McI.: Trachoma problems as dealt with at the Thirteenth International Congress of Opthalmology, 405
Morton, S. Archibald, and Leddy, Eugene T.: The treatment of boils and carbuncles by roentgen rays, 554
Mosquitoes, anopheline, and Malaria, in Minnesota, 410
Mouth and lips, Early diagnosis and treatment of malignant conditions of, 788
Murray, Clay Ray: The repair of fractures, 137
Mutation of streptococci: report of a probable case, 99
Myers, J. A.: Relationship between childhood and adult types of tuberculosis, 209
Myers, J. A.: The tuberculous child, 74
Myxedema and diabetes, A case of (case report), 578

Miscellaneous

Committee on Public Health Education: 54, 124, 196, 260, 334, 420, 504, 586, 660, 726, 838, 916
Consultation Bureau: 56, 128, 200, 262, 338, 424, 510, 588, 662, 724, 834, 918
Fellowships for training in extramural psychiatry, 922
Getting into print: an exhibit for medical writers, 919
Hospital chart ownership, 920
Licentiates, 279, 773
Medical ethics, 839
Minnesota State Board of Medical Examiners: 258, 333, 423, 591, 675, 725, 839, 920
New finger splint, A, 840
Practitioner and the Medical Society Library, The, 337
President's Letter: 50, 120, 192, 254, 330, 416, 500, 582, 656, 720, 830, 912
Proceedings Sixty-second Annual Session, Minnesota State Medical Association, 731
Report of the Dean of the Medical School, University of Minnesota, 672
Scope and aim of the Committee on the Cost of Medical Care, 511
Symposium on the kidney in health and disease, 507
Unlicensed cancer specialist convicted of practicing healing without a basic science certificate, 49

N

Nerves, cranial, Palsy of the, 880
Nervous disorders, The use of sodium amylethyl barbiturate in, 874
New, Gordon B.: Problems in plastic surgery of the nose, 242
Nose, Problems in plastic surgery of the, 242

O

Obstetrics, Careful, 41
Ocular manifestations of hysteria in children, 618
Olson, A. E.: Popliteal aneurysm (case report), 45
Olson, A. E.: Spinal anesthesia, 4
Otitis media, acute, Early or late operative treatment in complications of, 238
Ovarian dysfunction, Treatment by roentgen rays in, 186

Obituary

Benepe, Louis M., 201
Best, Floyd E., 57
Carman, Charles L., 57
Chamberlain, George Ellsworth, 509
Comstock, Alfred Erwin, 663
Cook, Paul Burns, 201
Davis, George S., 837
Frost, W. A., 663
Hovde, H. N., 129

Hoyt, Henry F., 201
Kaufman, Aloysius Julius, 347
Law, Arthur A., 589
Lyng, John A., 836
Moffatt, A. G., 129
Moench Louis Leypoldt, 509
Randall, Benjamin M., 509
Riggs, C. Eugene, 347
Russ, John Frederick, 663
Sherping, Olaf Thorstein, 57
Stiffler, M. L., 836
Wipperman, Paul Frederick William, 129

P

Palsy of the cranial nerves, 880
Paré, Ambroise—Military surgeon, 648
Pedersen, Arthur H., and Briggs, John Francis: Comminuted fracture of the pisiform bone (case report), 118
Peppard, T. A.: Pericarditis, 529
Pericarditis, 529
Pernicious anemia: an historical summary with especial reference to the occurrence of fever, 379
Pernicious anemia in the young, 297
Peyton, William T.: Circulatory tests previous to amputation, 896
Pharyngo-esophageal mediastinal fistula reëntering the esophagus (case report), 413
Phrenic nerve, Evulsion of the, for pulmonary tuberculosis, 545
Physiology of spinal anesthesia, The, 183
Plea for the radical treatment of incomplete abortion, A, 310
Poisoning from cinchophen (case report), 327
Polyps, Adenomatous, of the colon and rectum, 229
Popliteal aneurysm (case report), 45
Postoperative hypothyroidism, 235
Practical value of examination of blood smears, The, 860
Pregnancy, extra-uterine: antecedent and subsequent histories in 471 cases, 822
Pregnancy, The tetanoid syndrome in (case report), 190
Pre-operative care of patients for prostatectomy, The, 402
President's Address, 599
President's Letter: 50, 120, 192, 254, 330, 416, 500, 582, 656, 720, 830, 912
President, Minnesota State Medical Association, 1930, Dr. S. H. Boyer, Photograph, 46
Primary carcinoma of the lungs and bronchi, 605
Problem of disease of the paranasal sinuses, The, 877
Problems in plastic surgery of the nose, 242
Proceedings Sixty-second Annual Session, Minnesota State Medical Association, 731
Prostatectomy, The pre-operative care of patients for, 402
Prostate gland, testes, kidneys and bladder, Malignant lesions of the, 808
Prostatitis, acute, and seminal vesiculitis, The differentiation between acute appendicitis and, Report of two cases (case report), 252
Psoriasis vulgaris, The treatment of, with intravenous administration of acriflavine, 818
Psychoanalysis in reactive epilepsy, 180
Pulmonary asbestosis (case report), 495
Pulmonary complications of general anesthesia, 694

Q

Quain, E. P.: Lord Lister, 445

R

Rankin, Fred W.: The diagnosis of malignant conditions of the colon, 796
Rankin, Fred W., and Bargen, J. Arnold: Ulcerative colitis as a complication of abdominal operations, 375
Recognition of glaucoma by the general profession, The, 90
Rectal examination and the concealed second stage of labor, The, 110
Rectum and colon, Adenomatous polyps of the, 229
Recurrent lymphangitis, 902
Relation of physical findings to lung pathology, 80
Relationship between childhood and adult types of tuberculosis, 209
Repair of fractures, The, 137
Report of four cases of inoperable carcinoma treated with intramuscular injections of karkinolysin, A, 65
Respiratory infections, upper, Gastrointestinal symptoms occurring with, in infancy and childhood, 103
Retroperitoneal hernia (case report), 580
Rheumatic fever: a communicable disease, 37
Rigler, Leo G.: The early diagnosis of carcinoma of the stomach, 784
Rigler, Leo G.: The value of the *x*-ray examination in pulmonary tuberculosis, 25
Riley, William A.: Malaria and anopheline mosquitoes in Minnesota, 410
Robinson, John M.: Ocular manifestations of hysteria in children, 618
Robitshek, E. C.: Acute perforated peptic ulcer, 465
Roentgen rays, The treatment of boils and carbuncles by, 554
Ruby, Fred McK.: The industrial eye, 178
Ruhberg, George N., and Hengstler, William H.: Encephalitis, 888
Ryan, George, and Abbott, A. Clifford: Corbus' Disease, 315

S

Schulze, Albert G.: A plea for the radical treatment of incomplete abortion, 310
Schwyzer, Arnold: Spinal anesthesia with reduced dosage of spinocain, 855
Schwyzer, Arnold: Three cases of brain surgery, 517
Seminal vesiculitis and acute prostatitis, The differentiation between acute appendicitis and; report of two cases (case report), 252
Shannon, W. Ray: A case of tetany and edema in the newborn, 476
Sherwood, K. K., and Humphrey, W. R.: Pernicious anemia: an historical summary with especial reference to the occurrence of fever, 379
Significance of temporary blindness, The, 891
Simons, J. H.: Careful obstetrics, 41
Sinamark, Andrew, and Morsman, L. W.: Eye, ear, nose and throat anesthesia, 686
Sinus, hyperplastic, When is a, and what? And its parallel—the mucoid ear, 322
Sinuses, paranasal, The problem of disease of the, 877
Snell, Albert M.: Some recent advances in endocrinology, 8
Snell, Albert M., and Jordan, Ferdinand M.: Some clinical features of obstructive jaundice, 699
Sodium amylethyl barbiturate, The use of, in nervous disorders, 874
Sodium amythal in Cesarean section (case report), 328
Sodium chloride, The use of, in the treatment of varicose veins, 34
Sodium iso-amylethyl barbiturate (sodium amytal), The intravenous administration of, for the alleviation of pain during labor, 868
Some clinical features of obstructive jaundice, 699
Some observations on the etiology of tic douloureux with the clinical reports of a new method of treatment, 556
Some recent advances in endocrinology, 8
Spinal anesthesia, 4
Spinal anesthesia: Conclusions based on a study of 1,283 cases, 682
Spinal anesthesia with reduced dosage of spinocain, 855

Spinocain, Spinal anesthesia with reduced dosage of, 855
Stacy, Leda J., and Vanzant, Frances R.: Poisoning from cinchophen (case report), 327
Stangl, Fred H.: Intestinal foreign bodies (case report), 909
Stangl, Fred H.: Retroperitoneal hernia (case report), 580
Status of tinted lenses, 632
Sterilization, Vaginal, 318
Stomach, Carcinoma of the, 643
Stomach, The early diagnosis of carcinoma of the, 784
Stone in the upper urinary tract: its clinical manifestations and treatment, 636
Streptococci, Mutation of: report of a probable case, 99
Strobel, W. G., and Gillespie, M. G.: The use of sodium chloride in the treatment of varicose veins, 34
Sturre, J. R.: Sodium amytal in Cesarean section (case report), 328
Sullivan, Ralph R.: Congenital syphilis, 302
Sulphocyanates, Experiences in the use of the, 293
Surgeon, Coöperation of the dentist with the, in a general physical examination, 88
Surgery, Minor, 451
Surgery of the infant abdomen, 826
Surgery, plastic, of the nose, Problems in, 242
Sweitzer, Samuel E., and Allen, Philip K.: The treatment of psoriasis vulgaris with intravenous administration of acriflavine, 818.
Swendson, James J.: The intravenous administration of sodium iso-amylethyl barbiturate (sodium amytal) for the alleviation of pain during labor, 868
Symptoms and complications of chronic urinary obstruction, 154
Synopsis of the treatment of chronic arthritis, A, 708
Syphilis, Congenital, 302

SOCIETIES

American Association for the Study of Goiter, 661
American College of Physicians, 51, 336
American Proctologic Society, 422
American Public Health Association, 728
Annual meeting at Duluth, 590
Conference of Secretaries, 53, 126
Dakota County Medical Society, 508
Hennepin County Tuberculosis Association, 126
Houston-Fillmore County Medical Society, 52, 842
Inter-state Post-Graduate Medical Association of North America, 661, 725
Lyon-Lincoln County Medical Society, 842
Medical broadcast for the month: 51, 125, 197, 259, 335, 421, 508, 589, 661, 725, 841, 923
Meeker County Medical Society, 422
Minneapolis Surgical Society, 259
Minnesota Radiological Society, 335, 923
Minnesota Society of Internal Medicine, 335, 508, 841
Minnesota State Medical Association, 197, 259, 335, 505, 923
Mower County Medical Society, 53
Northern Minnesota Medical Association, 661, 728, 841
Northwest Pediatric Society, 422
Park Region District and County Medical Society, 841
Proceedings Minnesota Academy of Medicine, 58, 130, 202, 263, 341, 427, 664, 843
Ramsey County Medical Society, 53
Red River Valley Medical Society, 126, 842
Redwood-Brown County Medical Society, 422
Rice County Medical Society, 125, 198, 842
St. Louis County Medical Society, 842
Scott-Carver County Medical Society, 422, 508, 591, 728, 842
Southern Minnesota Medical Association, 589, 727
Southwestern Minnesota Medical Society, 53, 422
State Medical Meeting, 336, 421
Stearns-Benton County Medical Society, 336, 422
Steele County Medical Society, 53
Symposium on the kidney in health and disease, 421, 507
Transactions Minneapolis Surgical Society, 61, 344, 433, 924
United States Pharmacopeial Convention, 197
University Medical School—Kidney symposium, 335
Upper Mississippi Medical Society, 197
Wabasha County Medical Society, 591
Washington County Medical Society, 842
West Central Minnesota Medical Society, 842
White House Conference on Child Health and Protection, 125
Woman's Auxiliary, 336, 423, 923
Wright County Medical Society, 843

T

Tannic acid, The use of, in burns of children, 775
Teachings of medical experience, The, 219
Testes, prostate gland, kidneys and bladder, Malignant lesions of the, 808
Tetanoid syndrome in pregnancy, The (case report), 190
Tetany and edema, A case of, in the newborn, 476
Thomas, Gilbert J., and Exley, Erwin W.: Carbuncle of the kidney, 484
Three cases of brain surgery, 517
Thymus, The bovine, 17
Tibial fractures into the knee joint, 285
Tic douloureux, Some observations on the etiology of, with the clinical reports of a new method of treatment, 556
Trachoma problems as dealt with at the Thirteenth International Congress of Ophthalmology, 405
Treatment by roentgen rays in ovarian dysfunction, 186
Treatment of boils and carbuncles by roentgen rays, The, 554
Treatment of psoriasis vulgaris with intravenous administration of acriflavine, 818
Tubercle bacillus, First infection by the, 540
Tuberculids, 462
Tuberculosis, bovine, Incidence of, in humans, and report of the official control and elimination of bovine tuberculosis in Minnesota, 393
Tuberculosis of the intestine: its differential diagnosis, 457
Tuberculosis, pulmonary, Evulsion of the phrenic nerve for, 545
Tuberculosis, pulmonary, The value of the X-ray examination in, 25
Tuberculosis, Relationship between childhood and adult types of, 209
Tuberculosis, The childhood type of, 613
Tuberculosis, The management of (Part I), 28
Tuberculosis, The management of (Part II), 85
Tuberculous child, The, 74
Tuberculous infection, The incidence of, in school children, 216

U

Ulcer, peptic, Acute perforated, 465
Ulcerative colitis as a complication of abdominal operations, 375
Ulcus rodens of right eye treated by a conjunctival flap operation (case report), 44
Undulant fever, 713
Ureter, An anomalous extra-vesical origin of, 158
Ureteral stone with periureteral extravasation (case report), 910
Urethra, posterior, Congenital valvular obstruction of the (case report), 412
Urinary obstruction, chronic, Symptoms and complications of, 154
Urinary tract, upper, Stone in the: its clinical manifestations and treatment, 636

Use of barbituric acids, acetylene, spinal anesthesia, tribromethyl alcohol and other anesthetics in the Mayo clinic in 1929, The, 223
Use of several new derivatives of barbituric acid, The, 679
Use of sodium amylethyl barbiturate in nervous disorders, The, 874
Use of sodium chloride in the treatment of varicose veins, The, 34
Use of tannic acid in burns of children, The, 775
Uterine bleeding, abnormal, The diagnosis and treatment of, 172
Uterus, cancer of, The early diagnosis of, 793
Uterus, cervix of the, Distant metastasis in carcinoma of the, 489

V

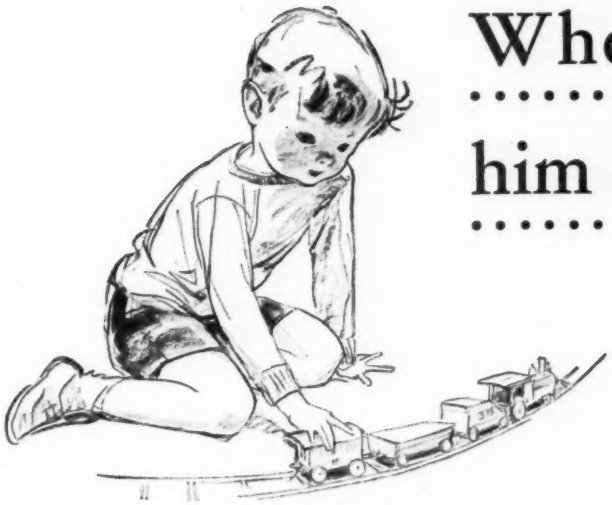
Vaginal sterilization, 318
Value of the X-ray examination in pulmonary tuberculosis, The, 25
Valvular heart disease in young adults, 624
Vanzant, Frances R., and Stacy, Leda J.: Poisoning from cinchophen (case report), 327
Varicose veins, Modern treatment of, 564
Varicose veins, The use of sodium chloride in the treatment of, 34
Veins, varicose, Modern treatment of, 564
Veins, varicose, The use of sodium chloride in the treatment of, 34

W

Walters, Waltman: Malignant lesions of the kidneys, bladder, prostate gland and testes, 808
Watkins, Charles H., and Heck, Frank J.: The practical value of examination of blood smears, 860
When is a hyperplastic sinus, and what? And its parallel—the mucoid ear, 322
Whitmore, Frank: Psychoanalysis in reactive epilepsy, 180
Williamson, George A.: A synopsis of the treatment of chronic arthritis, 708

Z

Zemke, E. E.: Meningo-encephalitis—a complication of epidemic parotitis, 107
Ziegler, Lloyd H.: Palsy of the cranial nerves, 880
Zierold, A. A.: Surgery of the infant abdomen, 826



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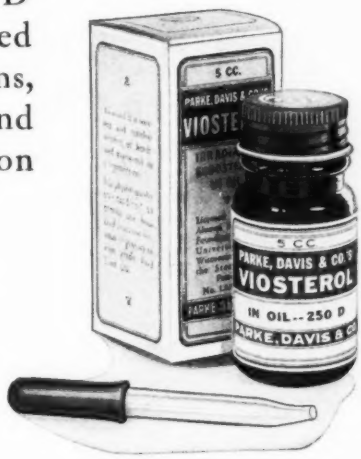

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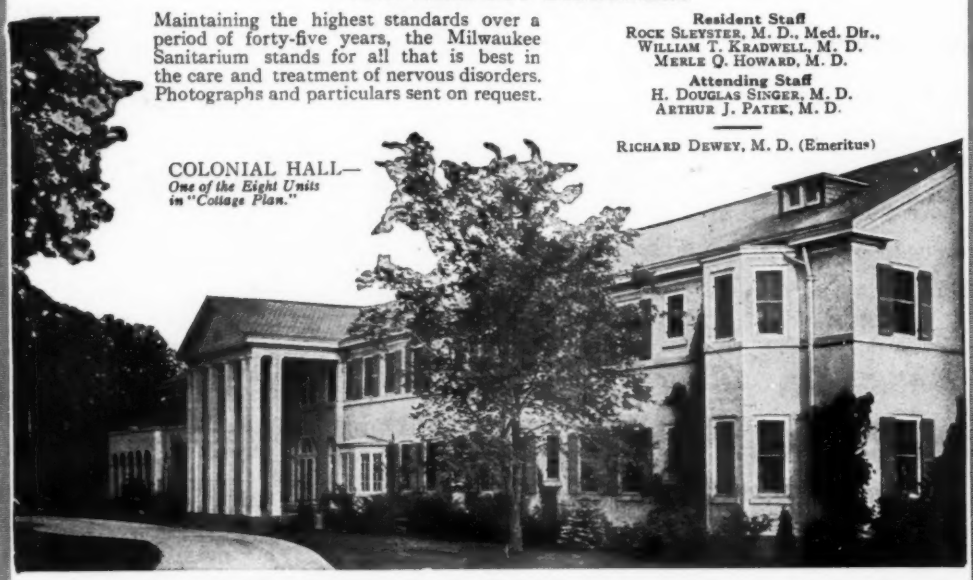

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